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# AMERICAN JOURNAL OF OPHTHALMOLOGY

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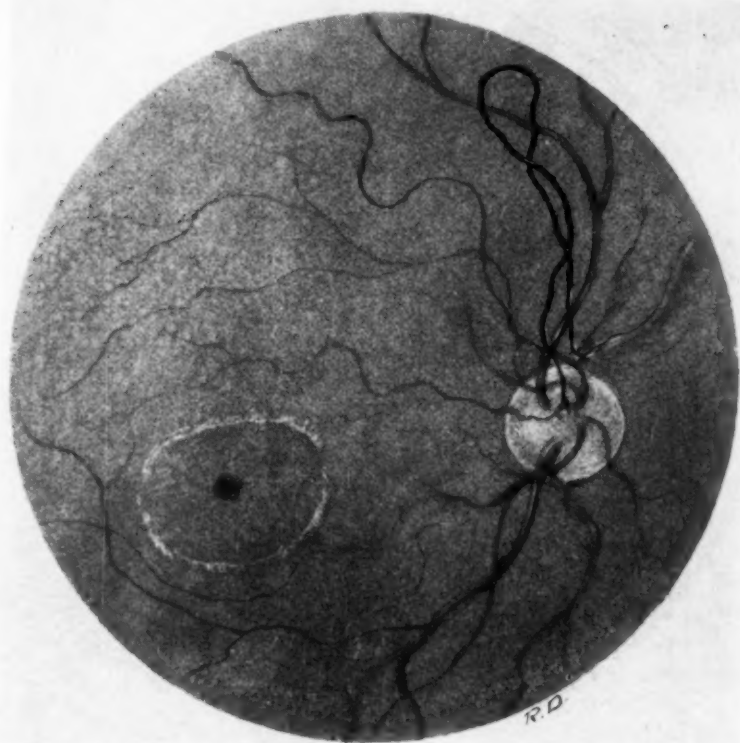


FIG. 1. FUNDUS SHOWING CONGENITAL LOOP OF RETINAL VEIN PROJECTING INTO THE VITREOUS BODY

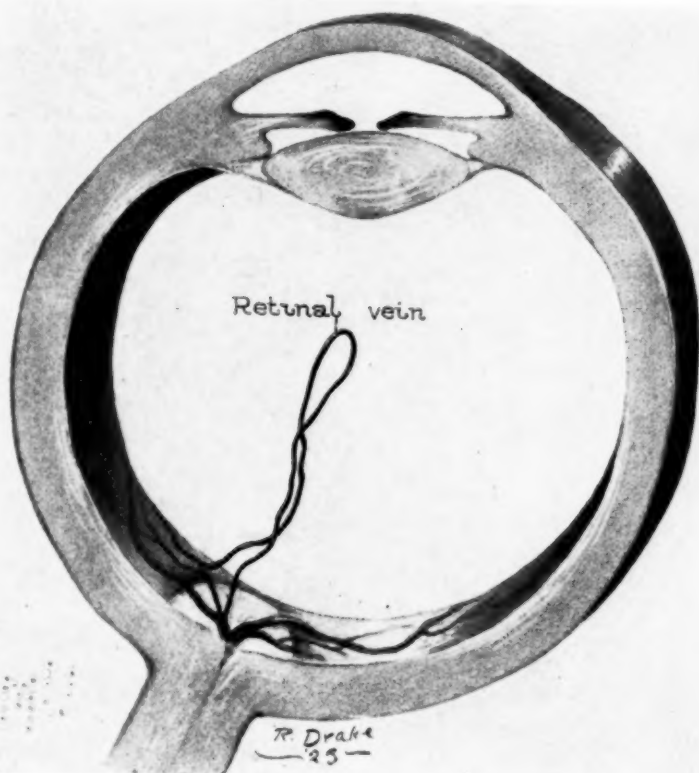


FIG. 2. DIAGRAMMATIC SECTION OF EYE SHOWING CONGENITAL LOOP OF RETINAL VEIN PROJECTING INTO VITREOUS BODY



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## ANOMALOUS SPIRAL LOOPING OF A RETINAL VEIN.

URBAN H. MERRILL, M.D., and HENRY P. WAGENER, M.D.

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This is the report of a case studied in the Mayo Clinic, Rochester, Minnesota, and also a review of somewhat allied cases found recorded in the literature. Such anomalous retinal vessels should no longer be confused with hyaloid remains. Most recorded cases are instances of arterial anomalies. Very few such deviations in the course of the veins have been observed.

Case A420542, J. L. W., a man aged 61 years, was examined at the Mayo Clinic in March, 1923, and his condition diagnosed as bilateral pyelonephritis, diffuse cystitis, latent syphilis, and mild arteriosclerosis of the central nervous system. Examination of the eyes revealed the vision, with correction, to be right eye 6/10, left 6/7. The pupils were slightly irregular, but reacted normally to light and in accommodation. The media were clear. There was mild retinal arteriosclerosis. In the fundus of the right eye was an unusual vascular anomaly. The superior nasal vein started normally, in the periphery, and passed along its usual course to within a disc diameter of the optic papilla, when it curved sharply outward from the retina, extended obliquely into the vitreous for about 2.5 mm., and, after forming a spiral loop of two turns, returned to the level of the retina and entered the central vein, which disappeared normally, in the disc. The vein was readily followed in its course. During its aberrant course in the vitreous, it was slightly attenuated, and was accompanied by a strand of glistening white tissue. Its walls, however, appeared normal and the lumen was patent. (Figs. 1 and 2, Plate IV.)

## CASES REPORTED IN THE LITERATURE.

We found a number of references in the literature to cases of congenital vascular loop formation in the vitreous. Many of these have been described as persistent hyaloid arteries and veins. So far as could be determined by a fairly careful search, thirty cases of extension of loops of the retinal arteries in the vitreous have been reported. Twenty-five of

these were collected by Leber. The bibliography published in his papers extends only up to 1908. Five cases have been reported since then by Nomura, Marquez, Crampton, Musy and Francis. A similar venous anomaly is much more rare. Leber quotes only one case, that of Fehr reported in 1902. In this case the vessel was a branch of the inferior central vein and extended in the form of an eight-shaped loop, about 1.5 mm. into the vitreous. The descending limb of the loop was attached to the papilla by a fine connective tissue strand. Two other unquestionable cases are on record. Of one of them Crampton says, "On ophthalmoscopic examination with a strong plus lens a slightly pulsating loop of vessels was seen close to the posterior surface of the crystalline lens. The vessel, which was bright red, appeared to spring from the lower nasal vein in the center of the disc; from there it passed forward in a close spiral of many turns. The fundus was otherwise normal and the vitreous quite clear. The grapevine loop was free from superfluous connective tissue, and seemed patulous throughout." The third case is that of Nomura, an accurate account of which is not at hand.

Liebreich, in 1871, demonstrated a vascular loop in the vitreous as a persistent hyaloid artery and vein. He says, "Here you will see, arising from the center of the optic disc, a little branch which runs out into the vitreous humor. It soon terminates in a loop which seems to make a direct transit from the artery to the vein, and later returns to the papilla by entwining itself obliquely with the artery three times. It terminates at the

central vein in a point which is not easy to observe because it is situated in the fundus of the physiologic excavation of the disc."

It seems doubtful whether such a direct transition could take place. More probably, as suggested by Kipp, both limbs of the loop are arterial, the darker blood in the descending limb being caused by partial obstruction to the blood flow, resulting from the spiral turns.

Apparently comparable to Liebreich's case is that reported by Walker, in 1903; altho his description is rather ambiguous, there may have been a real venous anomaly. Like Liebreich, he failed to recognize the fact that there is no hyaloid vein. He says, "In the right eye, there is a persistent hyaloid artery and vein. The vessels apparently spring from the inferior division of the retinal vessels and run forward into the vitreous, so that the summit can be seen with a +14.1. lens. The vessels are twisted like the strands of a rope, so that the apex of the loop has undergone two complete revolutions. The light and dark columns of blood of the artery and vein respectively, running in their glistening sheaths, pulsate distinctly, and are about as large as the nasal branches of the retinal vessels."

The origin of these anomalous vascular loops in the vitreous has been disputed. Early writers regarded them as persistent hyaloid arteries. In a case report published in 1881, Little suggested that the artery observed by him might be simply an errant retinal vessel. He described the vessel, however, as a persistent hyaloid artery. Hirschberg, in 1885, was the first to report a case definitely as a retinal artery. Leber supports the views held by von Hippel and Günsburg, that the vessels extending into the vitreous are not remains of the embryonic circulation. He asserts that many of the loop formations spring, not from the central artery itself, but from one of its branches; and run laterally or in an oblique direction, and not in the axis of the vitreous, as does the hyaloid artery. He also calls attention to the fact that a hyaloid vein does not exist, as the return flow from the capillary bed of the artery does not take

place backward toward the papilla, but forward into the veins of the iris.

As a substitute for the theory that these anomalous vitreous loops are patent hyaloid remnants, Kipp and von Hippel suggested that they are of the same nature as the retinal vessels, with the frequently observed excessive tortuosity in the retina proper. Like these, they occur in various degrees of development. There are all transitions from the quite short and rudimentary to the well formed loop, reaching far out into the vitreous and showing considerable torsion. Griffith, for example, found in one eye a well developed umbilical-cord-like spiral, while in the other, in a corresponding position, there was only a short knee shaped projection of the artery.

The origin of congenital tortuosities can be explained only thru a considerably increased longitudinal growth of one of the vessels, during the period of development. As an explanation of the occurrence of such an overgrowth in the region of the optic papilla, Leber suggests that, when a vessel bends acutely over the margin of the physiologic cup, the blood pressure is strongest in the line of the axis of the vitreous, and hence tends to elongate the vessel in that direction. Eddies in the stream at the sharp curve may result in torsion of the loop as it gradually forms, and later, the tortuosity of the more or less free lying loop may be increased by the normal movements of the eye.

In several of the cases previously described, mention has been made of a glistening strand, apparently of connective tissue, which connects the loop in the vitreous with the optic papilla or with the underlying retina. A similar structure was seen in the case reported here. It has been suggested that this tissue may be the outer wall of the vessel made more prominent by the absence of surrounding retina. It is possible also that it may represent remnants of the connective tissue brought in with the hyaloid artery, as seen fairly often on and around the optic disc in otherwise normal eyes. These explanations seem hardly probable, however, in view of the fact that

the strand seems to furnish support to the loop and to serve as an actual connection between the aberrant vessel and the underlying disc or retina. It might be reasonable then to consider this structure to be the internal limiting membrane of the retina, with perhaps a portion of the nerve fiber layer,

pushed ahead of or carried along with the retinal vessel in its process of outgrowth into the vitreous. So far as can be ascertained, no anatomic investigation of these anomalies has been made; therefore, the exact nature of the structures and processes involved must remain a matter of conjecture only.

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## GIVING SIGHT TO ANIMALS DEPRIVED OF FUNCTIONING EYES.

PROFESSOR HANS PRZIBRAM.

VIENNA, AUSTRIA.

The director of the institutions for Biologic Research of the Austrian Academy of Science here reports what has been done in this field largely by his students, and upon his suggestions. In a blind, cave dwelling species of proteus, seeing eyes were developed by exposure to red light. The eye of a salamander transplanted to its back, after a period of degeneration was regenerated, becoming approximately normal. In relatively low forms of vertebrates in very early life such restoration was possible. Functioning eyes were thus restored to blinded fish and amphibia. The technic of the operation is outlined. In some experiments it has been successful with young rats and rabbits, and where the behavior and reflexes indicated vision the retina and optic nerve were found to have been regenerated. In fish and frogs it has been possible to replace an opaque crystalline lens by a normal one.

To many it may seem impossible that eyesight could be restored to animals deprived of eyes. And yet experiments that we have been carrying on for some years at our institution prove that not only this is the case, but also that even mammals may be used in such experiments with success.

There is, indeed more than one way in which functionless eyes may be re-

placed by functioning ones. At my suggestion Dr. Paul Kammerer some years ago reared the blind Proteus of the Carniolian caves, an animal much like the North American Typhlomolge, from birth, in such conditions of light, that no pigment was formed, which would shade the eyebuds. He used the method of applying red light, that Dubois of Lyons, (France) had found

to protect the whitish color in the developed proteus. But as this author did not succeed in breeding the blind amphibians, he could not notice development of their eyes, as only quite young specimens are able to react to light by enlargement of their eyes, as Kammerer was able to show by breeding the proteus.

We have a sort of artificial cave, a cemented cistern, in which temperature and humidity of atmosphere are pretty much the same as in their natural haunts. Here proteus repeatedly gave birth to young, two at a time by one female. The eyes in the new born are like small pin heads. In red light, or after keeping them alternately in light and darkness, the young proteus developed large eyes, the size of which is relatively even greater than in similar seeing species, siren lacertina, for example. By holding a worm outside the glass aquarium in which the proteus with its new big eyes was kept, it could be demonstrated that it now reacted toward this object of prey like a seeing amphibian, for instance an amblystoma, trying to strike at it thru the glass wall.

This instance of restoration of eyesight is interesting, because probably the tribe of proteus have been blind at least for thousands of years (perhaps a vastly longer time), so that eyesight has been restored to eyes rudimentary for many generations. Probably other cave dwellers may regain functional eyes under favorable conditions, but we have not been able to experiment on other species, they not being at our command. Also, we must presume that, in the case of cave animals and others living underground and in the deep sea, the absence of light has been the cause of the rudimentation of eyes; light may also revive this faculty of eye formation and develop sight.

We could not well expect light to rebuild eyes lost by chance in animals with functional sight organs. Indeed the destruction of eyesight by too strong light is a known fact, and light has no influence on the regeneration of eyes in such animals as still enjoy this faculty, in the postembryonic stage

of development. C. Herbst had to admit this, contrary to his expectations while working on crustaceans at the Naples station.

It has been definitely proved by E. Uhlenhuth, now associate at the Rockefeller Institute for Medical Research in New York, whilst still working at our Institution in Vienna, that eyes of salamanders transplanted to the back of the same animal, after a short period of degeneration, again reorganize, whether the experiments are being conducted in light or complete darkness. That no trace of light could enter in the dark experiment, Uhlenhuth used our dark chamber which is shut off by double, well closing doors, and handled the animals only by touch when feeding or controlling them, as even the red light of a darkroom lamp had to be avoided.

Restoration of sight is of course not obtained in these experiments on transplantation, as the eye is not joined to the brain, but the optic nerve may enter a spinal ganglion. In quite young salamanders, taken from the uterus of the mother (the species used, *Salamandra maculosa*, does not lay eggs) or the newly born, the eyes may regenerate after destruction, as we and others (Hertling and Jellinek) have noticed. So that in vertebrates the restoration of lost eyesight by regeneration may happen, when we take relatively low forms (cold blooded) and young stages. It is, however, quite clear that this method of restoration is restricted to forms of high regenerative power; and can, therefore, not be of general applicability. We all know that in warm blooded animals there is no restoration of whole organs in postembryonic stages, nevertheless the tissues continue to close wounds and regenerate lost particles. It is not in our power to regenerate eyes in old fish and amphibia, or warm blooded animals, but by using the ways nature has shown us we have succeeded in transplanting whole eyeballs into orbits void of eyes.

The method of operation is very simple. I have termed it "autophoric," to designate that no artificial means



are resorted to. The eye placed in the orbit, which "clutches" it, as we may say, is quickly attached by bloodvessels, connective tissues and muscles, and later on also by the nerve. No suture is wanted, in mammals, the eyelids are kept closed for 24 to 48 hours, best by insertion of a pin. In fish and amphibia not even this is necessary, the eyes sticking on by the fluids quickly clotting together.

By my method Th. Koppanyi has succeeded in restoring eyesight to blinded fish (*Carassius, alburnus*, and others); to blinded amphibia, *Triton*, *Amblystoma*, *Bombinator*, etc.; to blinded mammalia, *epimys*, and together with Prof. W. Kolmer, *Lepus*. This restoration of eyesight to fish and amphibia was proved by the bearers of the new eyes jumping at the prey, and their reassumption of colors. We had previous to these experiments been studying color changes and their relation to eyesight; and this led us to take up the replantation of eyes, which had been tried before without convincing evidence of function.

It has been far more difficult to prove the restoration of eyesight in the rat and still more in the rabbit. We have tried all possible methods and have found that they all lead to the same conclusion: that in those cases in which the external appearance of the replanted eye did not show much difference from the normal eye, the behavior of its bearer did not differ from that of a seeing animal; while rats without eyes, or with unsuccessfully grafted ones, could not perform jumping tasks, or learn to discriminate between two food vessels by optical

signs. These biologic tests have been extended by Miss Auguste Jellinek to the reversion of a habit formed by optical means, and have supported the physiologic tests, such as corneal and pupillary reflexes, inspection of the eye by the ophthalmoscope, and the macro- and microscopic anatomy of the optic nerve and retina.

Those specimens in which the behavior and reflexes were most concordant with the normal, also showed good regeneration of the retina and nerve fibers, which grow centripetally, as in ontogeny, and in Uhlenhuth's deplantation experiments, towards the optic thalamus and reach its ganglionic mass. In a rat killed three quarters of a year after the operation the condition of retina and optic nerve is nearly normal, altho scars are still visible from the operation.

Lack of means have prevented our trying similar replantations on larger animals and monkeys, so that the experience necessary for the possible application of the autophoric method to human surgery is lacking. Are we, after all, hoping for the impossible? Our oculists tell us so. But would they not, also, have deemed the restoration of eyesight by removal of the lens impossible, had they lived before the invention of operation for cataract? And is not this, too, a mode of restoring sight to man with the help of glasses? In animals, as in fish and frogs, it has been possible to restore eyesight by taking out the lens obscured by cataract, replacing it by a fresh, clear one. Here again it was my autophoric method which allowed B. Weisner to perform this task.

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## CYSTICERCUS OF THE VITREOUS WITH CASE REPORT.

GEORGE H. KRESS, B.S., M.D.

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This paper gives the statistics of ocular cysticercus, the life history of *taenia solium*, its development within the human body and the morphology of a cysticercus. A case is reported observed from an early stage thru its development. The examination of the enucleated eye is also given. Read before the Pacific Coast Oto-Ophthalmological Society, June 21, 1923.

Ocular infection from *Cysticercus Cellulosae*, the bladder or larval stage of the pork tapeworm (*Taenia Solium*), is a rather rare disease; and especially so during recent years, which have brought a big advance in sanitary inspection of meat, food and water supplies.

### STATISTICS ON OCULAR CYSTICERCUS.

The rarity of this parasitic involvement of the human eye is illustrated by some of the following figures:

Dr. H. B. Ward<sup>1</sup> states that in the entire literature there are on record only some four hundred cases of ocular cysticercus, and of this number only four had been reported in the United States; one in 1874 by Reynolds, one in 1880 by Trumbull, one in 1884 by Minor, and one in 1907 by Rembe. In 1919 de Schweinitz and Wiener jointly reported another case.

In Europe the frequency of its detection seemingly depended not only on whether or not any particular people were frequent or large consumers of pork, and so liable to infection from the so-called measley or tapeworm pork; but also, upon the thoroughness of the sanitary inspection of meat, food, and water supplies which might have been in vogue; and upon the kind of medical and eye clinics in general use by the mass of people of a particular country, well conducted eye clinics favoring more frequent and more accurate diagnosis of the condition.

Thus Virchow reports, largely as a result of better meat inspection, in the number of cases observed at the Pathological Institute of Berlin, a reduction from 1.6 per cent in 1875 to 0.5 per cent in 1882, and to 0.16 per cent in 1903; or in all a diminution of nine tenths.

Vosgien<sup>2</sup> reports the frequency:

In the middle of the nineteenth century to have been three per cent; 1853 to 1866 in von Graefe's observations to have been 0.112 per cent; 1869 to

1885, in Hirschberg's observations to have been 0.116 per cent; 1880 to 1894, to have been 0.03 per cent; 1894 to 1904 to have been 0.0015 per cent.

Other figures are: Arlt in Austria saw four ocular cysticerci in 10,000 eye patients; Giut in Denmark saw one ocular cysticercus in 70,000 eye patients; Dufour in Switzerland saw four ocular cysticerci in 60,000 eye patients; Griffith in England saw one ocular cysticercus in 36,000 eye patients; and Dupuy-Dutemps in France saw one ocular cysticercus in 160,000 eye patients.

Dr. H. B. Ward also calls attention to the fact that a popular impression exists in and out of the United States that the pork tapeworm in the human is a frequent condition in our own country; but goes on to state that careful investigations by Stiles and others prove, that in the human *taenia solium*, as a matter of fact, is rather rare in the U. S. A.

In Vosgien's statistics, of 907 recorded cases of cysticercus localized in different parts of the body, forty-six per cent occurred in the eye, distributed as follows: retina, 32 per cent; vitreous, 30 per cent; subconjunctival, 30 per cent; anterior chamber, 7 per cent; orbit, 5 per cent; iris, 2 per cent; lens, 1½ per cent; and cornea, ½ per cent.

Hirschberg's investigations gave a preference habitat of the cysticercus, when found in France, for the conjunctiva; when found in England, for the posterior chamber, and when found in northern Germany, for the deeper regions of the eye.

### LIFE HISTORY OF THE PORK TAPEWORM (*TAENIA SOLIUM*).

Before taking up the report of the case which came under the writer's observation, an outline of the life history of the cysticercus, or rather of the pork

worm, of which it is the larval stage, may be germane to the subject.

In the first place, according to Stiles,<sup>2</sup> the group of worms known as Cestodes have distinct heads with 2 to 4 suckers, and in the adult forms or tapeworms

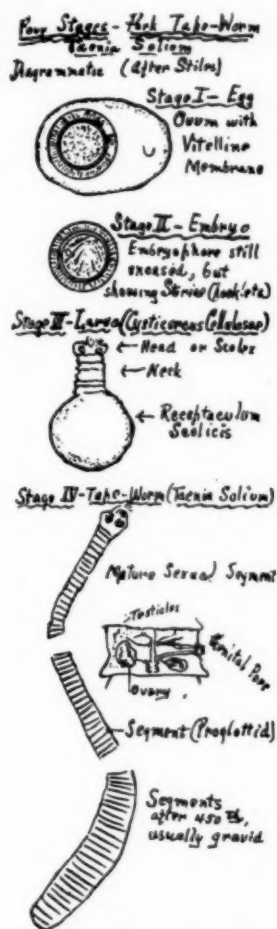


Fig. 1. Line sketch after Stiles showing the four stages of the pork tapeworm (*Taenia Solium*).

proper, have a whole chain or strobila of segments or proglottides, the segments of a single worm constituting practically a colony of their own.

The head or scolex has 2 to 4 suckers which may be provided with hooks; and on its apex it has a rostellum which is armed with hooks. The head is followed by a neck which segments transversely to form the proglottides. Each segment or proglottis possesses a full set of both male and female organs.

The subgroup of cestode worms known as *Taenia*, can produce in man an infection known as taeniasis, which clinical condition is again subdivided: into one, intestinal taeniasis, or infection with the adult tapeworm; and two, somatic taeniasis, or infection of muscles, connective tissue, liver, lungs, eye and other viscera with the larval stage of tapeworms. Examples of somatic taeniasis are one, cysticercosis (i. e., infection with the larval stage of the pork tapeworm), and two, echinococcosis (i. e., infection with the hydatid stage of echinococcus), as well as one or two other forms.

We are, however, in this article concerned with a case report of ocular infection with *cysticercus cellulosae*, the larval stage of the pork tapeworm.

As already stated, each of the several hundred segments of an adult tapeworm contains both male and female organs of generation, and ova are formed therein. Such gravid segments can be broken off and such segments and such ova can be found in the stools.

A human may therefore eat measley pork or drink water contaminated by the ova of the tapeworm, or partake of vegetables that have been irrigated and thus come into contact with such fluid, and so become infected; or by touching such pork and carrying the ova to the mouth; or by touching the hands or body or clothes of some person who harbors a tapeworm and who is thus discharging ova in his stools; but in one who is careless in habits of cleanliness and thus has ova on his person, infection may also take place.

Let us consider now the stages thru which the pork tapeworm passes: The first stage of a pork tapeworm's existence is the ovum, which in the beginning is much like other ova, with vitelline membrane and other morphologic conformation.

The second stage is the embryo or proscoplex or onchosphere stage, in which the vitelline membrane has been lost, and the encasing membrane of the ovum proper is also lost, releasing the striated embryophore, which by means of its six hooks attaches itself to the

intermediate host, the intermediate host of the cysticercus usually being the pig; but man himself, as in the case we report, can also be the intermediate host of the pork tapeworm.

The third stage is the larval or scolex, head or bladder worm, known as the *Cysticercus Cellulosae*, which stage is a further development of the second or embryo phase, the embryo discarding its hooks, and a tube with fluid coming into existence, characterized by a budding ingrowth at one spot. In this phase, from the embryo sphere and ingrowth, there develops the head or scolex.

The fourth stage is a continuation of the above, and in man comes into being when the cysticercus gains access to the small intestine and by its head or scolex attaches itself to the intestinal wall, and then by transverse segmentation or strobilation of the neck, forms the segments which make up the tapeworm as we are ordinarily familiar with it; the fully developed tapeworm shedding from its caudal end, usually beyond the 450th segment, the mature gravid segments containing the ova, such segments and ova then being evacuated in the stools.

#### HOW OCULAR CYSTICERCUS DEVELOPS IN THE HUMAN BODY.

Coming back to human ocular cysticercus, and considering how a cysticercus may happen to establish itself, say in the vitreous, the presumption would be that such a person had swallowed some of the ova; that one such ovum after losing its wall thru action of the stomach juices, permits its embryo to escape, and this embryo attaches itself to the stomach wall; to bore its way thru this wall, and by accident perhaps thru a blood vessel, thus gaining access to the blood stream.

In this blood stream it might by chance reach the eye, the supposition being that lodgment would be found in a choroidal blood vessel. Lodgment in retinal blood vessels may be possible, but since a goodly number of cases of cysticercus of the vitreous have first been noted as subretinal cysticerci, it is assumed that the choroidal blood ves-

sels are a more frequent site of lodgment.

The embryo may develop while existing subretinally, into the third, or larval, or cysticercus stage; or may continue its migration into the vitreous body, there to develop into the cysticercal stage.

In the vitreous it cannot get beyond this larval or cysticercal stage because its continued growth usually sets up eye disturbances that result in the disintegration of the eye and the destruction also of the parasite. And in the eye, the cysticercus only goes on to a partial development of the cysticercus or larval stage.

#### MORPHOLOGY OF CYSTICERCUS CELLULOSAE.

A more detailed morphologic description of a cysticercus would be somewhat as follows:

The cysticercus or bladder worm consists of a bladder or cyst like mass, of spherical shape, and from one portion of this encasing wall, first by an ingrowth or internal budding and later by an evagination of this area, the head or scolex is formed, the cysticercus then consisting of (1) the head or scolex; (2) the neck; and (3) the bladder proper, which last may be styled the receptaculum scolice.

The neck is contractile and can be both extended and retracted, and moved in different directions. When the head and neck are entirely retracted, only a fold or slit may mark its site on the vesicle or bladder wall. The extended head shows a projecting snout surrounded by hooks, and posterior to these are the suckers, usually four, and then comes the neck, with a somewhat transversely wrinkled appearance.

The length of time during which a cysticercus can maintain its vitality in the eye is not known, but von Graefe gave an estimate of two to four years; Zulzer knew of one patient harboring a cysticercus for twenty years; and Saemisch had one patient under observation for ten years, and knew of an individual in Paris who for years visited clinics and permitted an examina-

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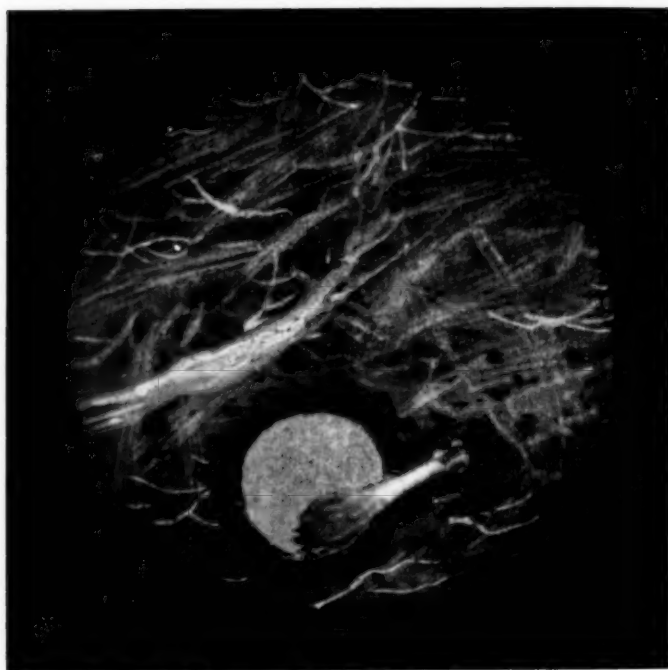
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CYSTICERCUS OF THE VITREOUS. APPEARANCE OF THE  
FUNDUS WITH VESICLE AND PROTRUDING HEAD

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tion of the cysticercus in his eye at a price of fifty centimes per examination.

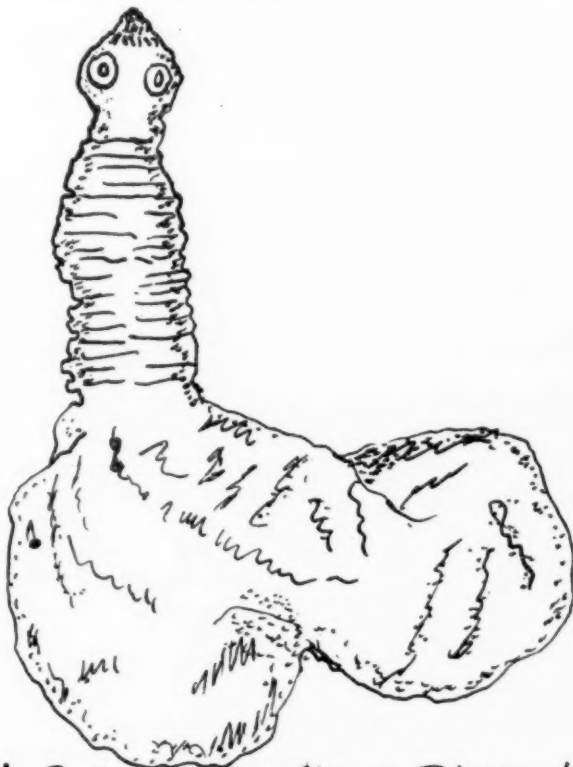
As to age periods for ocular cysticercus infection, 20 to 30 is the one in which most cases are recorded.

\* \* \*

With these preliminary remarks concerning this parasite which is so rarely

eye was 6/9 and with the more sensitive and irritable left eye was 6/60.

The patient was refracted with a cycloplegic, and the fundi at this time presented no special pathology. Under the cycloplegic, visual acuity registered: Right = 6/20, Left = 6/Light. At the trial case, with retinoscopic



*An Isolated Pork Measle Bladder-Worm  
(Cysticercus Cellulosae)  
With Extended Head (After Stiles)*

Fig. 2. An isolated cysticercus cellulosae, after Stiles.

seen in the human eye, we can pass on to the report of the case which came under the writer's observation.

Patient, Mrs. P. S., age 20, and at that time unmarried, came under the writer's observation on December 22, 1916, complaining of eye distress, especially in her left eye, and of infra-orbital and occipital pains. She stated she had worn glasses as a child, but had given them up in 1914 and lately had been doing considerable close work. Visual acuity with good right

findings, this was improved to: Right = 6/6, Left = 6/20.

On January 3, 1917, the patient was given the following prescription:

Right, Plus 1.00 cylinder at 90° = 6/6 plus 4: Left, Minus 1.00 sphere with plus 3.00 cylinder at 90° = 6/20.

These details are given because it was the good right eye which, uncorrected, had a visual acuity of 6/9, and corrected, 6/6 plus, which later became the habitat of the cysticercus parasite which this paper discusses.

The patient then passed from under the observation of the writer until February 6, 1922, having in the meantime been married. She stated that about five years after her first refraction by the writer, "her glasses had gone back on her", and requested a new refraction. Questioning elicited several recent attacks of tonsillitis, with some rheumatic pains. Tonsils large and filled with cheesy exudate.

Visual acuity on this date showed: Right = 6/Light, Left = 6/60.

With her prescription of January 3, 1917, she read: Right = 6/Light (whereas in 1917 this was 6/6 plus 4), Left = 6/15.

Her reply as to date of onset of the poor vision in this previously good right eye, was that she "thought the right eye went bad about one month before, i.e., about Christmas time of 1921."

Patient was at once ophthalmoscoped and the right eye revealed only a dull red pupillary reflex, with no blood vessels or fundus details visible, but showing a large number of swirling vitreous opacities. In the lower pole was a roundish grayish area having the appearance of a detachment of the retina. Tension of the eye was normal and there was slow direct and slow consensual light pupil reactions.

The previously poor left eye showed a fairly clear disc, and no evident pathology present. Patient's right eye was put under atropin dilatation for better observation, and iodides prescribed.

Under date of February 8th our notes show that the form of the mass which was located inferiorly in the region of the vertical meridian, was better made out, and in the superior nasal quadrant, a small grayish change was also noted thru the murky vitreous.

The obscurity of the process led to further interrogation as to the history of the eye trouble, and she stated that her eyes had begun to bother her about a year previous, when she was doing considerable close work. In December, 1921, or two months before, she had really noticed for the first time the failure in vision. In December, 1921, she had likewise discovered that

she had worms and was given treatment by her family physician. She thought the worms were about two or three inches in length and stated they were quite plentiful in the stools. She never saw segments of a tapeworm, only these little round worms. About three weeks previous she had taken a second vermifuge but had noticed no worms. Usually constipated, but otherwise her stomach and intestinal digestion was quite good. On questioning stated her husband owned a meat shop and that she helped behind the counter in selling meat.

*Laboratory examinations* about this time from the laboratory of Doctors Brem and Zeiler gave: Wassermann negative. (February 7, 1922). Stool examination for blood, pus, ova, and parasites negative (February 21, 1922).

Blood examination (same date): Leucocytes 7200. Differential leucocyte count: Polymorphonuclears, 60%; Lymphocytes, 31; Large mononuclears and transitionals, 4; Eosinophiles, 5. The red blood cells are normal in size, regular in shape and take the stain evenly. No nucleated red blood cells or blood parasites seen. No abnormal leucocytes seen. Platelets normal. Later, in August, 1922, Dr. A. H. Zeiler reported both ova and taenia solium segments in the stools.

The grayish blue mass in the interior portion of the eyeground now became the subject of more careful observation, and it was found under atropin dilatation that this mass had an almost perfect spherical form, and on moving the patient's head from side to side, this bluish white sphere would roll slowly from side to side in the vitreous, with the motions of the head. Under the atropin dilatation, the murkiness of the vitreous seemed to clear up somewhat, and at this time, dionin in 2% solution was used, thus hoping to bring about a better clearing of this vitreous.

The very unusual shape of this bladder like mass, (seemingly a perfect sphere), and its mobility, led the writer to again look up the whole subject of intraocular cysts, and he came

to the conclusion that the condition was none other than a cysticercus, and at a meeting of the Eye and Ear Section of the Los Angeles County Medical Association, held about this time, this patient was presented as being a case of infection with a *Cysticercus Cellulosae* in the vitreous.

On February 24th, 1922 a note was made in the patient's case history, of the fact, that the bluish-white vesicle, which had at this time an orange or orange red halo, would no longer move thru the vitreous with the patient's head movements. Visual acuity about this time showed no change from the amount already given.

The eye remained in much this condition thru March and April of 1922, the vitreous remaining somewhat murky. There was also noted what seemed to be folds of the retina and also veils of exudate or strings of what seemed to be a type of proliferating retinitis, these strings being located more particularly in the upper half of the vitreous body. Tension of the eye remained good, and there were no signs of active inflammation in the external eye tissues, nor were there any special further changes in the internal media and tissues of the bulb.

In the first week of May, 1922, a bluish-white spot tinged with orange appeared in the vesicle, being located more particularly in what one might call the inferior nasal quadrant of the vesicle; and before the end of the month the typical cysticercus head, with its contractile capacity to elongate and shorten itself, and turn and twist from side to side, in almost a corkscrew motion, was seen. (See plate V).

During April and June of 1922 there were times when the cysticercus head would be in evidence, and then again one could only see the bluish-white vesicle or bladder, with whitish tint or mark in the region where the head and neck seemed to be connected to the vesicle. On some days the head was seen to disappear entirely into the vesicle, presumably by a type of invagination; but by patiently waiting, the head would again be seen to evaginate itself. It was in June also, that small circular masses, like dots,

began to appear and, with movement of the eyeball, these little masses, which were about the size of the suctorial depressions on the head of the cysticercus, would move slowly about in the vitreous, in the same manner but somewhat more slowly than do other vitreous opacities.

The observer on a number of occasions thought he saw such a mass appear at one of the suctorial depressions, moving slowly away as if it had been spat out of one of these suctorial depressions. These little masses reminded him very much of spit balls. The cysticercus itself, with the two suctorial depressions that could be seen, and which looked like two eyes, and the snout, made the head of this parasite look somewhat like a distorted image of a young calf's or of a young pig's head. The small suctorial depressions seemed at times to be in constant in and out motion.

On June 28th, a note was made that the neck seemed to be composed of three major joints, and that the neck with the head seemed to have a length of somewhat more than one and one-half disc diameters. Sometimes when the infected eye was under observation, if the light from the ophthalmoscope would be shifted into the vitreous and then suddenly thrown upon the head of the parasite, the neck would slowly contract and the length of the neck grow shorter and seemingly shift away from the light.

About the first of July, 1922, a note was made that the neck seemed to be growing narrower, and that the head seemed to be more knobby and to have three suckers, one in the middle and one on each side. At this time also, the orange halo at the edge of the vesicle seemed to be less of an orange and more of an orange red, like the color of a setting sun.

On July 5th a Shahan lamp was used to produce an oblique illumination, and it was possible with the observer's naked eye to see what seemed to be the head of the worm in motion. On this date also, a notation was made that one or two of the spit balls seemed to be attached to the head of the parasite with delicate strings.

On July 12th the head of the parasite was not in evidence, only a round vesicle presenting, but the mass of exudate in the upper hemisphere now, here and there, showed some blood vessels present.

On July 17th the head and neck were again in full presentation, and the snout and suctional depressions active and seemingly producing some of the little spit balls.

On July 24th the head seemed again to have been invaginated, but at times it seemingly appeared from behind the disc at about the five o'clock meridian. This impression may, however, have come somewhat from a temporary twisting of the attachment of the vesicle. On this day, also, a peristaltic movement of the vesicle was noted, and this peristaltic wave or movement from this time on was seen on different occasions.

On July the 17th, there was only a black slit where the head ordinarily was located, and on July the 26th the suctional depressions seemed to be moving out and in like small pig snouts, and there seemed to be an active projection or movement of the so-called spit balls in the region of the head; and in addition, the undulating contraction of the vesicle or the peristaltic wave was at times also of a quick and jerky nature.

The above notes practically cover the activities of the parasite as they were noted on the days on which the patient came into the observer's office.

To summarize, there was at the onset what seemed to be a detachment of the retina, which under dilatation at a later date proved to be a bluish white cyst, this cyst being almost of a perfect spherical shape, and moving slowly in the vitreous, with movements of the patient's head. This clear bluish white cyst had practically at all times an orange or orange-red halo at its periphery, shading off somewhat as do the colors of the spectrum. Later the grayish white head and neck of the parasite put in an appearance, at about the five o'clock meridian, and this neck could change its shape and become thicker thru contraction, and

it could bend and twist on itself, and at times invaginate or probably contract within the cyst, until practically nothing but a slit was to be seen at its former site. There were also present the little masses of what seemed to be very small spheres of coagulated vitreous that had been sucked in by the suctional orifices and then spat out, these little masses at times showing one that would have a thread like a stringer, of a disc diameter or so in length, and that ran from the mass to the head of the parasite. Vitreous opacities in the form of dark stringers and veils as we ordinarily see them, did not develop. But instead the whole upper half of the vitreous body became what seemed to be an interwoven mass of grayish proliferating exudate, in places sticking out like small shelves, with here and there what seemed to be a fold of the retina, this upper half of the vitreous body having no sharp differentiation of detail, and having very little or no red reflex in places. The activity of the head and neck movements, and of the suctional and snout or rostellum areas, as well as the undulating movement of the vesicle proper, which undulating movement appeared at a later stage, have also been mentioned.

The patient was presented several times to the Eye Section of the Los Angeles County Medical Association, and also to the members of the Los Angeles Clinical and Pathological Society.

Mention was not made of the fact that the patient's husband was a Christian Scientist and that at one time her visits to the doctor's office gave rise to family misunderstanding, because the eye not giving any pain, and no improvement in vision being manifest, it was not understood why the patient should continue to consult a physician.

This social complication resulted in patient discontinuing medical observation August 13, 1922 to take up Christian Science therapy, and your essayist registered a mental regret and heartache at the knowledge that his small ocular parasitic friend would no longer come in for further observation. Prior

to this, we had told the patient that in the event of inflammatory reaction in either eye the patient, if wise, would seek the services of an oculist.

On January 4, 1923, almost five months later, and one year after the patient was first seen for the condition, the patient's mother called on your

area. Patient was put under atropin but even with repeated instillations, it was found that the pupil was everywhere tied down, with practically an almost complete seclusion of the pupil. Patient reported again the next day and was given atropin for home use until the writer could operate. Under

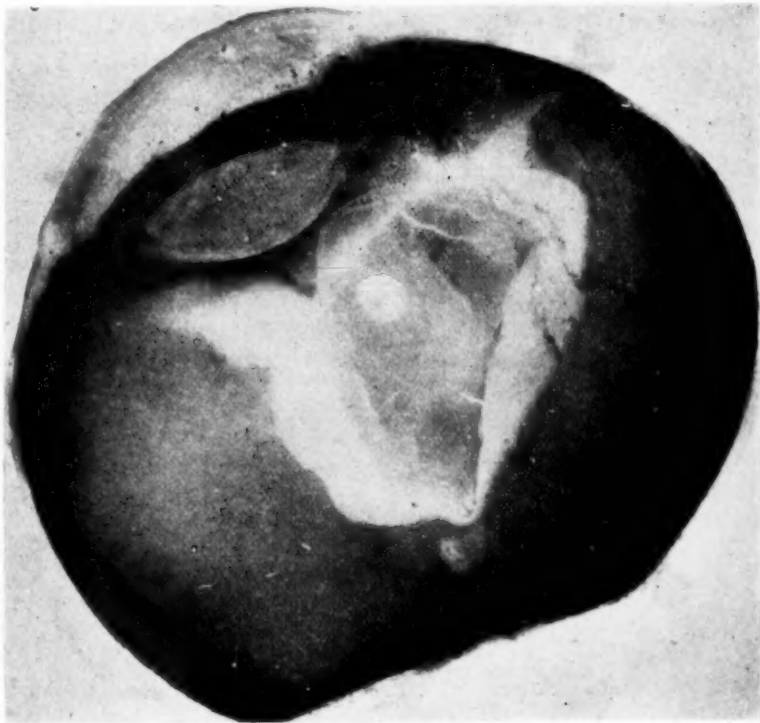


Fig. 3. Photograph of macroscopic mount of the enucleated eye, showing the cysticercus vesicle and head position thereon.

essayist, stating that the patient was suffering excruciating eye pain, which had commenced six days before, and that the remaining left eye also seemed irritated. The mother was advised to have the patient see an oculist and later in the day the husband, mother and the patient came to the office.

Examination revealed a very much congested and sensitive right eye, having the appearance of an intense iridocyclitis, with some increase of tension. With the involved right eye there was now no light perception at all, and with the left eye the patient read 4/60. With the ophthalmoscope there was no evidence of red in the pupillary

area. Patient was much more comfortable and the posterior adhesions broke away, except at the three, the five and the nine o'clock meridians. The fundus, however, was absolutely dark when viewed by the ophthalmoscope, and the inverted image from the posterior surface of the lens was very dim and diffuse.

Operation was advised and accepted, and on January 10, 1923, an enucleation by the open or Vienna method, was done, the patient returning to her home on January 13th, and the orbital tissues going on to good healing. Patient now wears an artificial eye and on February 12, 1923, a new glass was



prescribed for the left eye, namely a minus 1.50 sphere with a plus 4.00 cylinder at 105°, which combination gave a vision of 6/12 plus, and with which the patient has been quite comfortable and able to again do her housework and assist her husband in his store.

**PATHOLOGIC REPORT ON THE ENUCLEATED EYE SPECIMEN.**—There re-

"Microscopic specimen: The corneal epithelium is normal except in places there are a few indentations; with this exception the cornea is normal. The canal of Schlemm is open and the anterior chamber is filled with an albuminous exudate; in the exudate there are a number of white blood cells some of which have migrated into the mesh-work of the pectinate ligament.

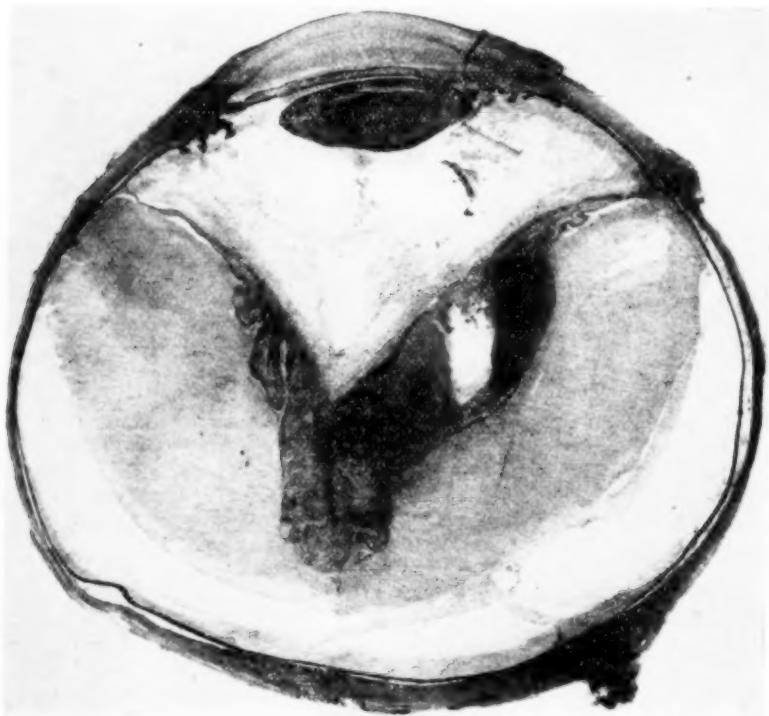


Fig. 4. Photograph of microscopic slide or section showing detached retina and other details as noted in report of pathologist.

main now only the presentation of the specimens and the lantern slides made therefrom, with the pathologic report of E. B. Burchell of the New York Eye and Ear Infirmary, who so kindly and excellently mounted the specimens. This report of date of May 8, 1923, reads as follows:

"Macroscopic mount: The anterior chamber is filled with an exudate, the retina shows a complete detachment which has been caused by a subretinal exudate; just behind the lens is a bladder containing the parasite which is surrounded by considerable exudate.

"The iris shows inflammatory reaction; this is marked by areas of round cell infiltration at the root of the iris. There is iris pigment on the anterior surface of the lens which has been the result of a posterior synechia.

"The sclera is normal, the choroid is densely pigmented and in places there are hyalin deposits on the membrane of Bruch (basal membrane of choroid). The retina shows marked inflammatory changes; it is completely detached by a subretinal exudate and forms a pocket which contains a number of leucocytes which have surrounded the

bladder of the parasite that is present in the gross specimen. The general condition is that of a secondary glaucoma caused by a cysticercus in the vitreous cavity."

**THERAPEUTIC PROCEDURES IN CYSTICERCUS INFECTION.**—As regards therapeutic measures to be used in this parasitic infection, in cases where vis-

dered, if the patient had remained under observation, and if the eye had been kept in a semiquiescent state as regards visual function thru the use of atropin, whether or not under these conditions the iridocyclitis which ultimately developed could, perhaps, have been postponed for a considerable time.

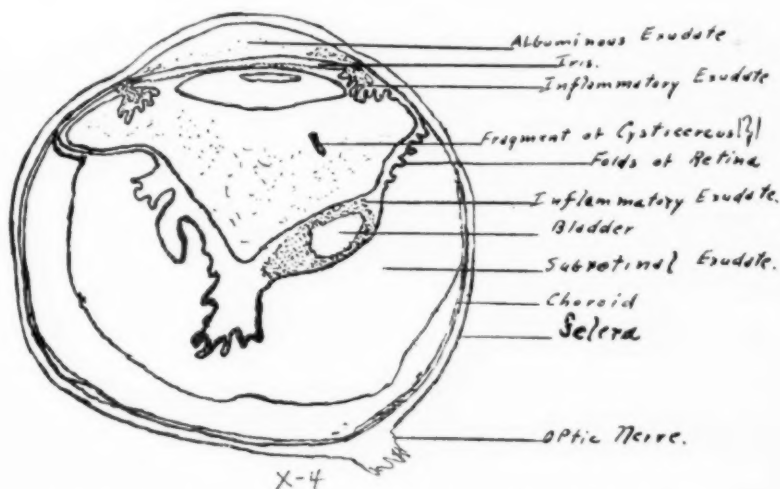


Fig. 5. Line sketch showing interpretation of one of the microscopic slides showing detachment of retina and other details.

ion is still fair or good, an attempt should be made to remove the parasite, this usually being done thru the operation of posterior sclerotomy, much as one attempts to remove a foreign body in the vitreous.

If the vision is seemingly lost, an expectant therapeutics may be followed, with at any time the possibility or necessity of surgical intervention along the lines just laid down.

In his own case the writer has won-

In conclusion, the essayist can only state that the comparative rarity of the condition, and also what one might term the moving-picture proclivities and characteristics of the parasite, when it was in action, made an interesting diversion in the daily routine in his professional life; and led him to write this article, thinking that the case report might also be of some interest to the members of the Pacific Coast Oto-Ophthalmological Society.

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# OPTIC ATROPHY MANIFESTED BY VISUAL DISTURBANCE FOLLOWING DISTANT HEMORRHAGE.

DELAMERE F. HARBRIDGE, M. D.

PHOENIX, ARIZONA.

A case is reported in which the visual impairment followed epistaxis. Such cases vary widely in clinical characters and probably in pathology. Brief summaries are given of the cases reported in recent years. Read before the American Ophthalmological Society, June, 1923.

The occurrence of visual disturbance followed by optic atrophy, after the loss of blood at remote parts of the body, seems of sufficient rarity to warrant recording each additional case coming under observation. This seems particularly true for this case because of its infrequency after so common a condition as epistaxis.

months. Then followed a gradual improvement during the succeeding months, more marked in the right eye than in the left.

This condition remained until about two years ago, February 4, 1916, when she suffered another severe attack of epistaxis, lasting about twelve hours and soiling a dozen bath towels. She

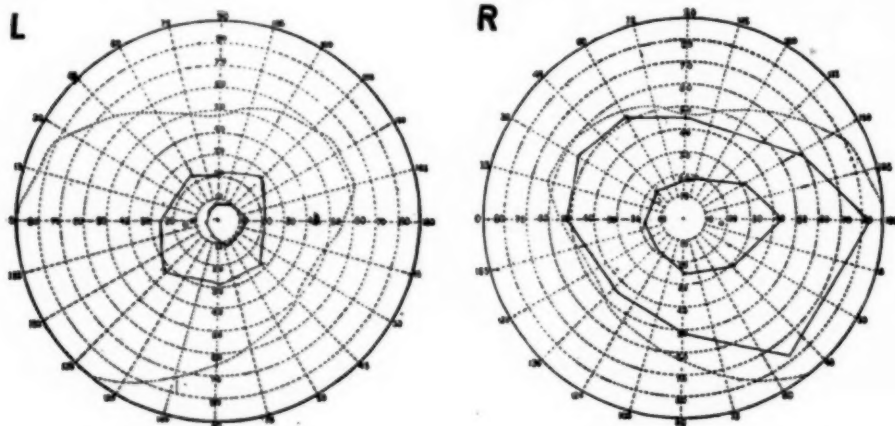


Fig. 1. Fields of vision, for form and for red, in optic atrophy following severe epistaxis.

**CASE.** Mrs. B., aged 40 years, a well developed woman, weight 150 pounds, with a generally healthy appearance, but rather erratic temperament. Family history negative, so far as able to obtain. Personal history, widow, married about fifteen years ago, mother of twins (apparently healthy girls, aged 13 years). She has suffered with frequent epistaxis of more or less severity all her life. Slight injuries, such as a cut finger, heal with no untoward symptoms. About three months previous to the birth of the twins she suffered severe nasal hemorrhage. This was followed about twenty-four to thirty-six hours later by gradually increasing loss of sight, leaving her practically blind for upwards of three

fainted and upon regaining consciousness, the left eye was blind, the right showed a marked reduction in vision. She was exceedingly ill for several days. During the ensuing period of three or four months, vision again gradually improved to about that which obtains at the present writing.

About two months previous to coming under observation, following a more moderate nasal hemorrhage, her vision became misty. This, however, cleared shortly without any apparent further reduction of vision. These attacks of hemorrhage are usually preceded by pain in the nucha, radiating over the head to the brow. The left eye had been red and inflamed recently, and also two years previous.

She believed that in some way this condition was associated with her impaired vision.

At the time of examination, vision of the right eye equalled 5/7.5; left eye, 5/60. Both irides respond to light and convergence. The right pupil, a shade less and the left a trifle over 5mm. in diameter. To the nasal side in the left eye is a small inflamed pterygium. Right eye, media clear, disc horizontally oval, the inner half of outline hazy; the rest, more indistinct. Disc pallid; vessels pale; the arteries slightly undersized. Left eye, faint haze in the lower portion of the lens; a few fine vitreous opacities, disc vertically oval, not well defined; definite gray atrophy, with no excavation. Arteries reduced in size and streaked; veins practically normal in size. Fields, right for form reduced, about 10-15°. Left, for form reduced to 30°; for color to 10°.

General examination: lungs and internal organs apparently normal; nasal cavity normal except the mucous membrane which was sensitive and apparently thinned, but no erosions or ulcers present; septum and turbinates practically normal. No well defined nervous lesions were made out; the patient irritable and erratic. Wassermann, T. B. fixation, and urine, negative.

#### REMARKS.

It is now twenty years since Sweet<sup>1</sup>, before this Society, presented his paper on optic atrophy following intestinal hemorrhage. In 1912, before the section on Ophthalmology of the American Medical Association, Zentmayer<sup>2</sup> made his excellent contribution. The purpose in again bringing the question before you is, that in as much as it presents some unsolved problems, the discussion may bring out certain phases which will lend support or confirmation to certain theories already offered, or suggest new possible explanations. While the condition is of infrequent occurrence, yet, the possibility of it presenting itself, and usually with such serious results as to the more or less permanent impairment of vision, seems to warrant

an attempt at considering certain etiologic factors.

It does not follow any particular type, nor is it related to any particular degree of hemorrhage. Many suffer severe hemorrhage, but do not suffer optic nerve disturbance, or any apparent interference with vision. Yet comparatively small, but frequently repeated hemorrhages, may result in serious impairment. The problem is particularly perplexing in a patient with negative laboratory findings and whose general appearance is that of health.

Careful studies of statistical data on this condition have been presented in the literature. A summary of these observations may be stated as follows: Haab<sup>3</sup> did not observe one undoubted case in 60,000 patients. Dufour<sup>4</sup> observed it but once in 30,000 patients. As to age; from young adult to middle life seems to furnish the greatest number of cases, yet, the condition has been observed in the two extremes of life. Sex; apparently more frequent in females, this however, should be qualified according to the source of the hemorrhage. While there are possibilities of serious visual disturbances due to hemorrhage from any part of the body, yet, the greatest number are associated with intestinal or uterine bleeding, nasal hemorrhage occasionally, and other sources very infrequently. There seems to be a wide difference as to the amount of blood lost.

Visual disturbance is usually bilateral, a small percentage being unilateral. The degree of loss of vision varies from serious embarrassment to blindness. One eye may show greater impairment than its fellow. Blindness usually occurs three or four days after the hemorrhage, in one instance eighteen days. Impairment may clear up, only to recur following subsequent hemorrhages. It may be permanent from the start. Stirling<sup>5</sup> estimates one third remain blind. The balance recover to a degree, rather promptly at first, and then slowly over a period of weeks or months to fair improvement. About 10% will show fairly good visual acuteness. The fields vary

widely as to the degree of contraction and the presence of scotomata.

The fundus appearance may show only slight haziness, a very moderate vascular contraction, retinal edema, neuritis or frank evidence of optic atrophy. It hardly seems correct to place within the scope of the condition under consideration cases in which either haziness or actual transient blindness occurs at or immediately following the hemorrhage, which immediately and completely clears up, with those evincing profounder and more or less prominent changes coming on later.

The disturbance may be within the eye, the retrobulbar region or the brain. It is more than likely that the pathology is not uniform. A few eyes have been studied microscopically. The interval between the hemorrhage and the time of sectioning the eyes, being considerable, these studies have not assisted materially. However, Goerlitz<sup>6</sup> was able to obtain in his case both eyes a few days after the onset of blindness. The ganglion cell degeneration theory of Ward Holden<sup>7</sup> seems to possess substantial possibilities. Yet, it is known that certain transient ischemias, such as result from toxic agents or vessel spasm, fully recover. The condition under consideration, however, is one in which sight is not usually lost until after several hours to days, and recovers to a certain point, but practically never entirely. The agent, whatever it may be, is active during this time, its destructive effect being permanent.

The above observations contribute much information of value. They, however, present factors subject to considerable variation. The important questions for clinical investigations are exact knowledge of the general health, the state of the individual's metabolism, his resistive powers, not only at the time but particularly preceding the attack. This demands careful search of the patient's personal history, the general physical well being, together with laboratory investigations for some vague or obscure symptoms. The use of certain toxic agents such

as quinin, tobacco or alcohol should not be overlooked. In this way possible progress may be made in discovering the underlying causative factor or factors.

In the case reported above there are certain outstanding features. The hemorrhage, likely venous, was from a frequent source; and yet, one of the less frequent in causing visual disturbance. Two serious losses of sight with fairly good recovery, were followed by a mild transient attack. This in a temperamental female with a history, since childhood, of periodic nose bleeding. During one of these attacks she was very ill, nauseated and greatly prostrated for several days.

An endocrin imbalance is suggested. Variations in perimetric findings are at least suggestive in that observations have shown that in certain endocrin disturbances accompanied with ocular defects the fields are not characteristic. Perchance there is dysfunction of a polyglandular nature. Hypoadrenalism impairs muscle tone lowering blood pressure. At times profuse bleeding occurs on account of endocrin gland disturbance; sometimes the administration of thyroid extract is successful in stopping such bleeding, and at other times suprarenal extract is beneficial<sup>8</sup>. Hetoghe<sup>9</sup>, Merklin and Walther,<sup>10</sup> Perles<sup>11</sup> and Taylor<sup>12</sup> have all demonstrated these facts by experimentation. Bottaro and Fournier<sup>13</sup> report a case of a female, aged 20 years, subject to severe menstruation and epistaxis (no eye symptoms). Thyroid therapy reduced the menstruation to three days and arrested the nasal hemorrhages. When the remedy was withdrawn the disturbance immediately returned. Darier<sup>14</sup> used adrenalized serum successfully in hemorrhage causing visual disturbance. Underlying these known facts, however, there must be some metabolic process causing the endocrins to function wrongly.

Little help can be offered patients with profound visual disturbance when coming under observation late. The conditions present are the end results of the injury. In early cases intravenous injections of adrenalized serum

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followed by transfusion of saline solutions and the administration of suprarenal and thyroid therapy seem to be the palliative measures indicated, which would afford an opportunity for a more complete physical investigation.

The literature since 1912 has been searched and all reported case records, as far as possible to obtain, have been summarized. These 18 case reports in connection with Singer's<sup>15</sup> 198 in 1901 and Zentmayer's 24 cases in 1912, making a total of 240 cases, give a fairly complete summary up to the present time. Ages, ranged from 30 to 57 years. Sex, 10 were females and 8 males. Hemorrhage, epistaxis 3, gastric ulcer 6, uterine 6, injury 1, amputation 2. All showed optic atrophy except two.

Fields contracted to varying degrees. Visual disturbance occurred from 12 hours to 10 days after the hemorrhage. Improvement in vision, from counting fingers to 6/7.5. Goerlitz's patient died, the eyes were examined microscopically a few days after the hemorrhage.

#### REPORTED CASES.

Pincus<sup>16</sup>. Five patients, all with optic atrophy following a papillitis. The ocular disturbance came on from two to eight days after serious hemorrhage; two, due to amputation; one, epistaxis; one, gastric ulcer; one, uterine hemorrhage. One theory is the production of grave posterior cord lesion; the other, reduced blood pressure, augmented by a reflex vascular tone.

Perrin<sup>17</sup>. First case, blindness followed two hours after a severe gastric hemorrhage. After intravenous serum injection vision was partially restored. Second case, blindness four days after severe epistaxis. Fields became normal, vision 1/6.

Cantonnet<sup>18</sup>. Blindness following hematemesis. Vision improved, contracted fields remaining.

Terrien<sup>19</sup>. Female, aged 30 years. During the succeeding four months following confinement, at which time considerable blood was lost, patient complained of impaired vision. Vision of the right eye was 1/4; that of the left 1/5. Discs, atrophic and well defined; vessels, nor-

mal; fields, contracted with absence of the lower half.

Terrien<sup>19</sup>. Male, aged 24 years—suffered with a crushed leg. Twelve to fifteen days after injury, the discs were indistinct; the vessels were dilated; fields greatly contracted and almost entirely absent below. Gradually vision improved; some pupillary reaction returned; atrophy of the discs was quite marked and the arteries were somewhat narrower. He believes the trouble is of retinal origin.

Darier<sup>14</sup>. Female—sudden complete amaurosis of both eyes following metrorrhagia. No light perception or pupillary reaction. Sight was recovered after eighteen days, after a subconjunctival injection of mercury salicylarsinate.

Duhot<sup>20</sup>. Optic neuritis following profuse hemorrhage.

Oyenard<sup>21</sup>, A. Optic atrophy following metrorrhagia.—Female, aged 45 years: following abortion bled to unconsciousness. Regaining consciousness, objects appeared misty; three days later vision was reduced to counting fingers at one meter. Later, vision rose to 2/3 in the right eye and 1. in the left, fields markedly contracted.

Calhoun<sup>22</sup>. Female, aged 38 years—suffered a nervous breakdown four years previous to present attack. Profuse uterine hemorrhage lasting one week which followed the passage of large blood clots. Then occurred a violent hemorrhage, from which she collapsed, becoming unconscious and nearly dying. Hemorrhage ceased. Ten days later, when able to sit up, discovered she was unable to see. This lasted three weeks when slowly sight was partially restored. Four months later first ophthalmic observations were made. Patient, anemic and weak. R.V.=20/100, with 2.75 $\times$ 1.50x 90=20/50; L. V. 15/200 unimproved. Disc, very pale; retinal anemia; vessels, contracted; partial hemianopsia.

Goerlitz<sup>6</sup>. Male, aged 57 years. Hemorrhage from duodenal ulcer, blind within ten days, and death a few days later. Opaque discs and edematous retinas. The vessels very thin and pale, no venous stasis. Sections showed intense edema of

the disc. Between the nerve fibers were peculiar projecting nodules, consisting of polymorphous, partly nucleated formations. Behind the lamina cribrosa were foci of degeneration, possibly due to a thrombotic process.

Alt<sup>23</sup>. Male, aged 45 years, exsanguined and semiunconscious, due to several hemorrhages from a gastric ulcer. Eyes examined one month later while in a partial stupor. Bare light perception in the right, and fingers at 6 ft. with the left. Both pupils fully dilated; the right, fixed; the left, reacted slightly. Three months later, right pupil smaller, slight reaction, fingers at 6 ft. The left pupil reacted normally; vision, with  $-1 = 20/30$ . Fields, nasal 10, above 15, out and

down 20. The disc and vessels as when first observed.

Harbridge. Female, aged 40 years. Erratic temperament, suffered more or less severe epistaxis all her life. Three months previous to birth of twins, suffered an especially severe hemorrhage, which was followed twenty-four hours later by loss of sight. Sight gradually improved during the succeeding months to practically normal. Eleven years later following a very severe attack of epistaxis, at which time the patient was very ill, a second, but not as complete loss of sight occurred. At time of examination, right field moderately contracted;  $V = 5/7.5$ . Left field markedly contracted, vision  $5/60$ . Both nerveheads, atrophic.

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## OPERATION FOR KERATOCONUS

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Methods previously described may fail to keep the cornea in good apposition until healing is complete. In the one now practiced sutures are introduced thru gold plates before making the corneal incisions. The sutures and plates are removed in about a week. Two cases thus treated are reported to illustrate results. Read before the Colorado Congress, July, 1923.

In 1917 I reported before the section of Ophthalmology of the American Medical Association the operative results of two cases of keratoconus. Since then I have operated on several cases by the same method, with results not altogether gratifying. The main difficulty was found in keeping the wound edges together long enough for them to become permanently sealed. As long as the stitches with the gold plates remain, the wound is closed and the cornea remains flat, but I have removed the plates as late as ten days after the operation with an apparently beautiful result, only to have the disappointment of finding the wound separated the following day. Naturally, there would be some improvement in vision due to contraction of the scar resulting from the excision of the elliptical segment of the cornea, but the results in these cases were far from ideal.

I have tried Fox's method of making an incision with a Graefe knife and excising a piece of the flap with a small iris scissors. I found it most difficult to place the sutures without going thru the entire thickness of the cornea, and almost impossible to keep the iris from prolapsing during the manipulation. Also the fear of injury to the lens was ever present. It occurred to me that if I could place my sutures before opening the anterior chamber, and then complete the excision of the flap without danger of prolapse of the iris or injury to the lens, the operation could be made safer and more effective.

Stauffer, in 1906, reported a case in which he transfixed the cornea with two curved needles behind the part to be excised, and removed an oval piece 3 mm. wide and 6 mm. long, bringing the wound together by the sutures already placed. The vision was brought from nil to 6/36. The objection to this

method, however, is a serious one, that the sutures pass into the anterior chamber.

The method which I now employ is to excise an elliptical piece of cornea about 3 mm. wide and 7 mm. long from the upper quadrant of the cornea. Two double armed sutures, threaded thru a gold plate such as that used by me for muscle advancement, are passed thru the lower lip of the wound, then the upper lip, and tied loosely over a second plate. Three fine cambric needles are then passed thru the cornea so as to include the elliptical segment. These are intended to hold back the iris and the lens. The middle loops of the threads are then turned aside. A corner of the remaining thickness of the cornea within the elliptical segment is picked up with a sharp dural hook and excision of the entire thickness of the elliptical segment is completed. The sutures are then tied and the cambric needles removed. The sutures and plates are removed on the 6th or 7th day. The operation is delicate and tedious, but seems safer than other methods in use. The results in the following two cases seem to justify the procedure.

Case 1. Miss E. C., age 21 years, was first seen by me November 1, 1922, referred by Dr. Nelson M. Black. She was given her first glasses when 8 years old. History of gradually failing vision for 8 years; 9 months before coming to St. Louis she noticed that she could not read, nor could she see well at a distance. She stated that no glass improved vision and that she could see better without glasses. Examination showed very pronounced conical cornea in both eyes. Curvature too great to measure with the keratometer. Small opacity on tip of right cone, more marked than on left. O.D.V. = 2/300. with -27 D. Sph.  $\ominus$  -3. D.Cyl. ax. 90° = 15/75. O.S.V. = 3/200. With -30 D.Sph. = 15/300.

Operation was performed on the left eye at the Jewish Hospital, November 2, 1922. The left eye was selected because the vision could not be improved much with glasses, altho slightly better without. Iridectomy was performed to prevent iris prolapse, atropin 1% was instilled, xeroform powder dusted over the cornea, and a dry gauze dressing applied over both eyes.

On November 17th, the vision was 5/200; —3. slightly improved. There was pericorneal injection, photophobia, iris caught in the wound at the nasal side and patient was experiencing much discomfort. On November 23, the cornea was clearer and vision had risen to 15/100. November 25th, anterior chamber was reformed and vision 15/75 +2. On the 27th, she developed severe pain and lachrimation in the left eye which increased, due, we found, to increased tension. December 21st, tension with Schiötz tonometer was 52 mm., 2% pilocarpin was instilled, which reduced the tension to normal, but it rose again after a few days and refused to respond to pilocarpin or eserine, the vision going down to 4/200 on December 20. On January 5th, a sclerocorneal trephining was done, excising a piece of iris from the nasal margin of the wound. The pain subsided and the tension has remained normal since. December 30th, vision was 15/75 and a few of 15/50, a —4. slightly improving. As she was feeling fairly comfortable and the danger from glaucoma past, she was permitted to go home to Wisconsin. She wrote that there was no change, on June 5th.

Case 2. Mr. M. C., age 25, referred by Dr. Louie V. Stegman, was first seen by me February 6, 1923. In 1916 he first

noticed he could see better with the right eye than with the left, but previous to that is sure he had good vision for distance and near, as he could sit in the back of the room at school and had no difficulty in seeing the blackboard. He associated his eye trouble with stomach trouble which began in 1917, when he had his appendix and gall bladder removed and a kink in the ileum straightened. At a second operation an attempt was made to suspend the pelvic colon, which is distended, but he still suffers as before.

Examination showed a marked conical cornea, both eyes. O.D.=10/300—20.0. D.Cyl. ax. 180=15/100; one of 15/75. O.S.=8/300.—24.0.D. Cyl. ax. 0.⊖+13. O.D. Cyl. ax. 90=15/75. Operation was performed on the left cornea Feb. 8, 1923. Sutures and plates were removed 8 days later. The patient remained in the hospital 3 weeks. On March 3rd the wound was healed and the cornea much flatter, but the entire upper half of the cornea was cloudy, with slight pericorneal injection. O.S.=15/50; with —3.⊖—15.D Cyl. ax. 60°=15/40 and part of 15/30. He was discharged and sent home to Battle Creek, Michigan. On June 1st, Dr. Stegman wrote that the vision in the left eye without correction was 20/100; with —5⊖+5.5 Cyl. ax. 80° vision was 20/60+2. A few of the vessels running over to the wound from above are small but still pink with blood. The iris does not seem to be caught in the wound.

While but two cases are reported, the results are sufficiently encouraging to justify a belief in the advantage of the method employed over others used by the author.

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## PRACTICAL ASPECTS OF IRREGULAR ASTIGMATISM.

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With astigmatism that is regular and can be corrected by a cylindric lens there is always some that cannot be corrected, irregular astigmatism. One form, symmetric aberration, is particularly important to be taken into account when measuring refraction with the ophthalmoscope, or testing the vision in partial cataract. In skiascopy the scissors movement is caused by greater curvature opposite one margin of the pupil than near the other margin. The subjective effects of irregular astigmatism include the blurring, distortion and doubling of light or letters. They can be studied by covering a definite part of the pupil and in the same way demonstrated to the patient. Read before the Section on Ophthalmology, College of Physicians of Philadelphia, October, 1923. (See p. 141.)

Astigmatism is due to the action of dioptric surfaces and media so turning rays that come from one point that they can not be focused at another point. It may be divided into "regular," which can be "corrected" by a cylindrical lens, and "irregular" that cannot be corrected by a cylindrical lens, or by any other refracting surface that it is practicable to produce.

Another distinction between the two is: In regular astigmatism the refracting surface that causes it has the same curvatures in all its parts altho at every point of the surface the curvatures differ in different meridians. Such a surface may be compared to that of an automobile tire. A 34x4 inch tire has a curve in one meridian with a radius of 17 inches and at right angles thereto a curve with a radius of 2 inches. At every point of its circumference the tire presents exactly the same curvatures; altho in the different meridians they present such a difference.

In irregular astigmatism the surface causing it curves differently at different points. Excavations, facets, grooves, cicatricial distortions of the cornea, or distensions such as cause keratoconus, or buckling in of the cornea such as occurs sometimes after cataract extraction under cocaine, cause irregular astigmatism. It may also arise from variations in the index of refraction of different parts of the cornea, or crystalline lens.

But the aspects of irregular astigmatism here to be discussed do not require much consideration of their causation, or exact seat. Whether due to irregular surface or variable refractive index; whether arising in the cornea, or the crystalline lens, or on the an-

terior or posterior surfaces, irregular astigmatism has certain practical effects that it is the present purpose to consider. To indicate its relative position it is here sufficient to indicate it as located in a certain part of the pupil. A certain form of defective ocular refraction has been designated the "symmetric aberration" of the eye. But it, too, may be here discussed as merely one form of irregular astigmatism.

### SYMMETRIC ABERRATION.

Let us take two striking illustrations of the practical importance of this form of irregular astigmatism. In the last three months, I have seen in consultation, a young man who has lost serviceable vision from one eye by traumatic detachment of the retina. The trauma was at first not emphasized, and his eyes are both somewhat myopic and about equally so. The question arose to what extent was the detachment due to trauma; to what extent was it associated with the changes that produced myopia? This was of great practical importance both with reference to the matter of accident insurance, and for the prognosis as to his visual future. One of the consultants thought he discovered a beginning detachment in the other eye.

Both of this patient's eyes showed marked positive symmetric aberration. That is; with the ophthalmoscope the region about the posterior pole of the eye was seen to be about 3 D. myopic, when viewed thru the center of his pupil. But when seen thru the extreme periphery of his widely dilated pupil, this same portion of the fundus was seen best without any lens, or with a weak convex. The question of the relative elevation of the



retina at a certain point, was, therefore, complicated by the difference produced by seeing it thru a slightly different part of the pupil. We finally agreed that this appearance of a beginning detachment in the better eye, was due to this refractive condition, and to a slight lesion of long standing, of which we finally obtained a clear history. The subsequent history of the case has confirmed this view. The lenses in the above case were quite clear, and probably presented an aberration reached by normal development.

In this case the pupil was allowed to contract and he was again tested with concave lenses, running from 0 to 15.D. Repeated tests showed, that his best vision 0.5, thru a 4 mm. pupil, was obtained with  $-13$  Sph. The same vision was obtained with  $+0.50$  when his pupil was dilated. He was finally given  $-8$  Sph. which gave distant vision 0.3, and enabled him to read easily type visible with standard vision at 1 meter.

Such negative aberration is present in practically every eye suffering from

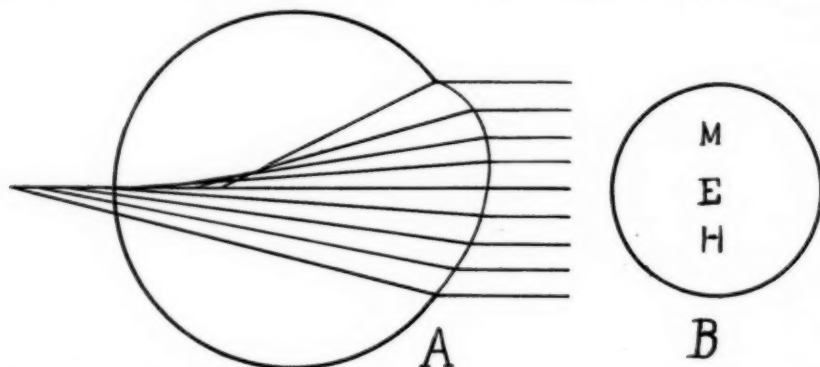


Fig. 1. Irregular astigmatism causing scissors movement in skiascopy. A, course of rays; refraction myopic thru upper, hyperopic thru lower part of cornea. B, pupil indicating myopia above, hyperopia below, emmetropia at middle of pupil.

The second case was that of a man of 51 seen within the last month. He came with R. soft, with deep anterior chamber, slightly bleached iris, excluded pupil and opaque lens. In L. the vision had been diminishing gradually for years, and was now 0.01. The crystalline was quite hazy; but with concave lenses vision was brought up to 0.2 with  $-16$ .D. Sph. I had his pupil dilated with cocaine and euphthalmin, and on looking in with the ophthalmoscope could see thru the periphery of the pupil vessels of moderate size and the optic disc, without any lens, or with a  $+1$ . lens. There was no myopic crescent, or other fundus lesions suggesting myopia. The myopia was due to change in the lens nucleus. This is the most extreme case of such change in refraction that I have seen. But changes of 2 or 3 diopters in elderly people are not rare, and an alteration of 6 or 8 diopters is not very rare.

early nuclear cataract. It is of the highest practical importance in finding out what the patient can really see; and in giving him his best vision either by keeping the pupil dilated, or choosing for him the lens best suiting his undilated pupil. In this case, without lenses the best vision was 0.01 thru a 4 mm. pupil; and thru a 7 mm. pupil it was 0.5. Differences of this kind though very rarely so great in amount, are present in all cases of beginning nuclear cataract. Yet hundreds of cases of cataract have been cited to prove the beneficial effects of a certain medical treatment for incipient cataract, without one mention of the diameter of the pupil as a factor affecting the visual acuity. Such evidence is worthless, whether it is used in support of potassium iodid, or dionin instillations, or subconjunctival injections of mercury cyanid.

The presence of symmetric aberration is easily demonstrated by skia-

scopy in nearly all eyes having clear media and dilated pupil. It causes in the periphery of the pupil a ring of light in which the movement is the opposite of the movement shown by another light area situated about the center of the pupil.

#### SCISSORS MOVEMENT ASTIGMATISM.

Another form of irregular astigmatism is forced on our attention by the "scissors movement" of light areas in the pupil when examined by skiascopy.

This form of irregular astigmatism is the effect of rather regular increase of the refraction of the eye from one margin of the pupil toward the opposite margin; and can easily be understood by a diagram illustrating increasing curvature of the cornea as we pass from one margin to the other. (Fig. 1). This kind of irregular astigmatism is about as common after cataract extraction as is regular astigmatism. It causes many of the failures to get good vision after cataract extraction, and unfortunately nothing can be done with the lenses at our command to improve such vision; altho it is conceivable that a cylindric lens could be ground, with curvature increasing from one side of the axis to the other, and so adjusted as to help correct a particular eye.

The most striking case of this kind of irregular astigmatism that I have met was in a patient who had a cataract extracted by Mr. Bader of Guy's Hospital in London. Except for this defect the result of the operation was very good. The media were quite clear, the fundus apparently normal. Vision could be brought up by the stenopaic slit or pin hole disk. But there was a high degree of this kind of irregular astigmatism. Mr. Bader had tried long and faithfully to find lenses that would bring up the very low visual acuity, but in vain. He told the man that thru use of the shadow test I might be able to do it; and so, in the course of his wanderings as a book agent, this patient came to me in Denver. My efforts achieved no better success than those of Mr. Bader.

In general the scissors movement, seen by the shadow test, gives some

indication of the direction of the meridians of the regular astigmatism present in the eye; and the spheric lens that brings the two areas of light to meet and separate at the center of the pupil shows how much hyperopia, or myopia, there is in this important part of the pupil,—the visual zone. Careful observation of the effects of different operations for cataract, in causing such irregular astigmatism, might furnish one criterion for judging which is the best method of operation. The most common practical effect of this form of irregular astigmatism is the difficulty it causes in the measurement of regular astigmatism, by either objective or subjective methods.

#### SUBJECTIVE PHENOMENA.

In all eyes the forms of diffusion areas are determined largely, and, after correction of the refraction with lenses wholly, by irregular astigmatism. They are very much more noticeable when the pupil is dilated, either by dim light, or by a mydriatic. The conventional figure for a star, the doubling of the horns of the crescent moon, monocular diplopia or polyopia, are all subjective phenomena of irregular astigmatism.

The forms of such figures present an infinite variety. Compare the figure given by an electric arc light in the right eye, with that given in the left; the form perceived with the naked eye with that seen thru your correcting lenses; or with the eye rendered 1. or 2.D. myopic, or hyperopic. When the variations thus produced in the diffusion images for one eye have been studied, you can begin to appreciate the infinite variety they present in the eyes of patients.

To some patients these are the most important symptoms they have noticed; they speak of them again and again. When you ask them "does this glass make the letters better, or worse?" they cannot be diverted from telling you "each letter has a sort of a blur going up from it"—"all the letters have tails to them"—"every letter looks double"—"there are two lines instead of one," and so on, to your utter

weariness and disgust. They constitute an obstacle to the subjective testing of refraction, as real as spasm of the ciliary muscle and more common. This is something that every oculist should understand, know how to explain to his patients; and to take into careful consideration, in planning his methods of measuring refraction, the lighting of his office and the background against which his test letters are shown.

When diffusion images are present every line of a test letter is affected by them, more or less. Those of irregular astigmatism remain, when those of spheric error, or regular astigmatism, have been removed by correcting lenses; and their continuance may lead to fear on the part of the patient, or the oculist, that the best correction possible has not been found. Here is the very important reason for post-mydriatic tests, and for good general illumination of the room in which subjective testing of refraction is carried on. To emphasize, by a large pupil, the diffusion caused by spheric ametropia or regular astigmatism is important. But it may be equally important to minimize the diffusion caused by irregular astigmatism. This is one reason for testing the refraction with a miotic in cases of conical cornea.

For study of the subjective appearances of irregular astigmatism, the cutting off of different parts of the pupil is the important method. With a pupil rather large, from feeble light or a mydriatic, a line, like a telegraph wire against the sky, will appear double to most eyes; and this doubling will be seen by most persons whatever the direction of the line and irrespective of the presence or absence of regular astigmatism. It is due to the fact that most eyes have positive aberration and the periphery of the pupil is myopic. Verhoeff has called attention to this effect in the doubling of the lines of smaller letters on the test card. In reality it occurs with every line of each letter looked at. It can be understood by remembering the prismatic action of every part of a lens, except its optical center; and

that in irregular astigmatism the unequal curvature in different parts of the lens results in different positions for the condensation or focussing of the rays passing thru them.

If, while looking at this doubling of a line, a card is brought gradually before the pupil, with its edge parallel to the line, one of the two images will disappear leaving the lines single. This occurs when the card has shut off one edge of the pupil. The remaining image is formed by light coming thru the opposite periphery of the pupil, that coming thru the central area being so generally diffused that it forms no image.

To observe the part of the diffusion image formed by light coming thru a certain quadrant of the pupil, the corner of a card can be thrust before that quadrant. Narrower sectors of the pupil can be investigated by using a more acute angle of card, or by thrusting the point of a lead pencil before the eye. In this way each particular ray of a star can be connected with the part of the pupil (generally with the part of the crystalline lens) that gives rise to it. The stenopaic slit from the trial case, moved thus across the pupil, gives information of the same kind.

When it is desirable to thus investigate internal areas of the pupil, a black spot of appropriate size and shape may be made on glass as a microscope slide, and this spot held before the eye. Such an obturator may be of India ink, or of black paper cut to proper size and shape, and gummed on the glass.

With devices of this kind it is easy to demonstrate to the patient the cause of the blur he notices. Even if no lens can be obtained that will correct the eye, so as to eliminate such diffusion images, it is of practical importance to the patient to stop his worrying about it, by a correct understanding of its character, and it is worth while for his professional advisor to thus demonstrate that he understands the case. The patient should know that his complaint is understood and considered.

As a help to understanding the conditions which complicate the selection of the best spheric and cylindric lenses,

it is worth while to study carefully the irregular astigmatism of eyes affected by corneal distortion, by scars of inflammatory, traumatic or operative origin. No operation like iridectomy, tattooing, or lens removal for optical purposes should be undertaken without such a study of the eye. Little has been said of the irregular astigmatism of keratoconus, or incipient senile cataract; either of which might be given an hour for their discussion in detail.

#### METHODS OF STUDY.

The effective examination of a case demands that, as a result of wide study, long training and good physical condition, the mind be alert to signs of every possible condition that may have a bearing on the ocular problems presented thruout the routine examination; and that recourse be had to special methods and tests, to follow out the clues so developed. To give such clues the ophthalmometer may be of use, but they must be followed out by other methods.

The ophthalmoscopic examination should include viewing the fundus details thru various parts of the pupil; and comparison of the clearness with which they are perceived from these different positions, and of the lenses necessary to bring them out most clearly thru each part. The eye of the observer may be drawn back from that of the patient, with attention fixed on some detail, as a small vessel; and by slight shifting of position, the image can be watched thru the different parts of the observed pupil. For high degrees of irregular astigmatism ophthalmoscopy gives the most positive, definite and valuable information.

Skiascopy is most valuable for studying the variations of refraction in different parts of the pupil, when these are of low or moderate degree. For this purpose the source of light should be bright and small as practicable; and the patient's eye should be viewed from a relatively short distance. Sometimes the accurate correction of the spheric error and the regular astigmatism, in a relatively small but uniform part of the pupil will give higher visual acuity than is obtainable in any other way. Justice to the patient demands search for and skiascopic measurement of such areas; for the accurate correction of them may be impossible to work out in any other way.

The test lenses are not to be neglected in the study of these cases. They are the final arbiter. Their decision is influenced by all factors that affect visual acuity, endurance and comfort. It is wonderful how good the vision that may be obtained thru some limited part of the pupil, when much larger portions are worth very little for accurate vision; and in some cases repeated trials ranging over a wide variety of lenses may reveal this, when other methods have failed.

The method of studying the results of interrupting the entering rays, for certain parts of the pupil, has been outlined. The examiner has a great field for the display of ingenuity in modifying and applying this method, for no two eyes present the same problems. It has a double application, as a diagnostic resource, and as a means of teaching the patient the explanation of symptoms, for which he seeks help.



## HISTORY METHODS TREATMENT OF INTRAOCULAR FOREIGN BODIES.

WALTER V. MOORE, M.D.

BROOKLYN, N. Y.

This begins with the use of a lodestone by the ancients and of fixed magnets from the fifteenth to the nineteenth century. These were followed by the electromagnets, first small then the giant magnet of Haab. The latter was used for diagnostic purposes. Then came the deflections of the magnetic needle brought near the eye with a foreign body. The sideroscopes following the siderophone. Finally the X-rays used by proper methods for localization became the principal reliance for diagnosis. The ophthalmoscope and corneal microscope have been used for the cases in which the foreign body was visible. Read before the Brooklyn Ophthalmological Society, October 18, 1923. See p. 222.

The physicians and specialists of the past have handed down to us very little of value in the matter of the diagnosis or treatment of intraocular foreign bodies. They knew of the magnetic properties of the lodestone, but employed it solely in ophthalmic ointments and apparently without any desire or intention of removing foreign bodies. We are told that the surgeons of Ancient India used the magnet in general surgery for the purpose of extracting subcutaneous foreign bodies, but no written records have been handed down which even hint at its use in the eye.

The first written description of the employment of the magnet in ophthalmology comes from the pen of the Dutch physician Hieronymous Brunswyck; who published in 1497 an account of his successful attempt to remove a foreign body from the superficial layers of the cornea, by means of a magnet. This operation he had performed thirty-five years previously. Fabricius Hildanus records a similar and also successful attempt, about one hundred twenty-five years later. Then for two hundred years we hear nothing on the subject at all, until Nikolaus Meyer, who practiced first at Bremen and subsequently at Minden, wrote in 1842 as follows:

"I was called to the smith G—into whose eye a glowing piece of steel had flown. The small long piece of steel had forced itself thru the sclerotic and under the iris, and could not be seized. With the help of a magnet weighing 30 pounds, we succeeded in drawing forth the foreign body. The very painful inflammation gave way to leeches and applications of cold water, after

which aqua laurocerasi was added with great improvement." (*Medicinische Zeitung, herausgegeben von dem Verein für Heilkunde in Preussen. Vol. XI, 1842, No. 11, p. 50*) Unfortunately Meyer does not state the outcome of his epochmaking operation.

The next advance along these lines was made by Dixon of London. In 1859 he employed a permanent magnet to remove a piece of scissor blade which had lodged in the vitreous four weeks before. He drew the fragment close to the wall of the globe and then extracted it by means of forceps thru a scleral incision. Then McKeown of Belfast, bolder than the others, inserted the tip of his magnet (a large permanent one) directly into the vitreous thru a scleral wound and so succeeded in withdrawing the foreign body. This was done in 1874. At about the same time, Julius Hirschberg of Berlin, greatly dissatisfied with the clumsiness and difficulty in handling the permanent magnets powerful enough to be of any value in this work, devised a hand electromagnet; and in 1877 he gave to us his invention which, with slight improvements, is still in use. Subsequently Sweet and others have constructed much more powerful hand electromagnets than that of Hirschberg.

Recognizing the disadvantages and dangers of scleral incisions and their possible complications, Haab of Zurich worked along different lines and designed the giant magnet which he presented at the meeting of the Ophthalmological Society at Heidelberg in 1892. His idea was that "He who has the most powerful magnet will obtain the best results"; for he contended that



smaller magnets were powerless to act on minute foreign bodies, unless in actual contact with the foreign substance, while his magnet was of such strength that it would attract the particle however tiny, even tho working from a distance of one inch.

Not only did Haab advocate the exclusive use of his magnet in the removal of foreign bodies, but he also laid great stress on its usefulness as a great aid in the diagnosis of the presence of attractable particles within the globes in doubtful cases. Ophthalmologists had long been handicapped by the limited means at hand for accurately diagnosing the presence of extraneous matter within the eye, and of course a great deal of research had been done with a view of determining not only the presence but also the exact location of the foreign body. Artificial mydriasis, while known to the ancients and practiced by women of all times as an adjunct to beauty, was never used extensively until the modern era. Galen mentions its help in giving to cataract patients better vision in certain cases, but we hear very little about it until Himly enthusiastically extolled its merits about the year 1801. The drugs he employed were the extracts of hyoscyamus and belladonna. The general use of the dilatation of the pupil did not come about until after the discovery of the ophthalmoscope by Hermann Helmholtz of Berlin, who described his instrument in 1851—the greatest instrument ever given to Ophthalmology. Of course improvements have been added and at present we have many varieties of ophthalmoscopes, reflecting and electric, with which to view the wonders of the fundus oculi.

As a diagnostic aid to the presence of foreign bodies, the ophthalmoscope has a limited field of usefulness, because of the rapidity with which the media of the eye cloud after injury, from hemorrhage and exudations and the rarity of the examination's being made immediately following the injury, before the cloudiness has intervened. We are indebted to Helmholtz also for his efforts in the advocacy of oblique illumination in the study of the exter-

nal structures of the eye; which, with the assistance of one of the many loupes or microscopes, reveals so much in the observations of the cornea, iris, etc. Unquestionably the greatest advance along these lines is the Gullstrand slit lamp used in conjunction with the powerful corneal microscope, which has so recently opened new and greater possibilities and whose entire field of usefulness in ophthalmology is almost beyond our fondest hopes.

But to go back: Following the invention of the ophthalmoscope, and at about the same time that the various types of magnets were coming into use, many of the pathfinders were devoting their energies to devising more accurate means of diagnosing the presence of foreign bodies in the globe. The siderophone and the sideroscope were created. The former was the idea of Jannsen and consists of a sort of a telephone attached to an electromagnet. When brought near a piece of iron a change takes place in the current, and sounds are detected in the telephone.

The first to use the magnetic needle for the diagnosis of magnetic foreign bodies within the eyeball was Pooley; who, with that true spirit of research, experimented tirelessly and tabulated the deflection of the needle by different sized particles at various distances. Then followed the more elaborate sideroscopes, those of Asmus, Hirschberg and Gerard being the most noteworthy. All who have used this instrument enough to have learned its technical difficulties, which are admittedly very great, are most enthusiastic about its usefulness even up to the present time.

When Professor Roentgen of Vienna discovered the X-rays, in 1895, it was at first thought that their value in ophthalmology would be very limited, because of the protected situation of the eye in its bony socket. French surgeons experimented and reported unfavorably the following year. For a time the media were considered impermeable. But the crying need for the help that might be obtained from this marvelous new machine, spurred the investigators on, in spite of repeat-

ed failures. At last Williams of Boston succeeded after an exposure lasting ten minutes in obtaining a picture of a fragment of a copper cartridge, which was removed by scleral incision on the first attempt. This was the first success with the X-ray, in the diagnosis of intraocular foreign bodies.

Naturally methods improved at the hands of such pioneers as Clark, de Schweinitz, Sweet, and others. Difficulties were overcome, and at the meeting of the American Ophthalmological Society in May, 1897, many papers were presented, the most important of which was Sweet's, which gave the first ac-

curate method of definite localization. This established the practicability of accurate localization of foreign bodies by means of the Roentgen ray. Various methods followed rapidly and are still being presented. The great majority are based on mathematical calculations and the results are wonderfully correct. I have purposely omitted to mention Dr. Dixon's method in view of his being with us this evening.

The ophthalmologists of today have indeed inherited an extensive equipment of diagnostic and therapeutic aids for the localization and treatment of intraocular foreign bodies.

## DETECTION AND LOCALIZATION OF INTRAOCULAR FOREIGN BODIES.

GEORGE S. DIXON, M.D.

NEW YORK CITY.

The character of the accident causing the injury throws important light on the case. The greater number of magnetic foreign bodies come from use of hammers, especially in attempting to remove hoops from barrels or boxes. A broken needle rarely remains in the eye. Glass comes from an explosion. It can be recognized by the X-ray, if of low penetrating power. Cases were cited in which the source of the foreign body could not be ascertained. In some cases of cataract an unsuspected foreign body was present. Read before the Brooklyn Ophthalmological Society, October 18, 1923. See p. 222.

Your chairman did me the honor to ask me to appear before your society and read this evening. I told him that I would come over and talk, but I did not feel like preparing a paper. The slides I will show many of you may have seen before. It is well to consider the cause of these various accidents resulting in foreign bodies in the globe and orbit. The chief cause is the hammer. It will probably account for the great majority of foreign bodies in the eye. Another very prolific method of getting a foreign body into the eye is the removing of hoops from barrels and boxes. If you have ever undertaken to remove a hoop from a barrel you will remember that you struck up. We have a very great number of foreign bodies in the eye caused that way. It is quite common. The breaking of drills by machinists is another very common method. Turning steel—where the machinist probably drives his tool too hard—the steel is too brittle and it flies off and he receives a foreign body. The same is true of brass or copper.

The breaking of needles in power machines is also a very prolific source of foreign bodies. A peculiar thing about this is that I have never found a needle in the eye. It is also true of a nail. When a needle breaks it penetrates the globe but the momentum is sufficient to pull the other end out and it flies on, leaving the wound. The cutting of steel, brass or copper wire is another common way. It is rather uncommon to have a foreign body the result of a flying nail. It is usually a piece broken from the nail or the hammer. Those who have driven nails will know that the nail flies and you may never be able to find it. Another way of foreign bodies entering the eye is the bursting of steam and water gauges on boilers. Another source of trouble is the unexploded dynamite charge which is left in a hole and someone strikes it. A man strikes it with a pick axe and his face is filled with particles of iron, copper, etc. Dr. Weeks had a man sent down to him from Nova Scotia. He was in a mine and

was sent in to clean up. His face was literally peppered with foreign bodies. One eye was gone and with the other he just had perception of light. He had a cataract but there was no foreign body any place except near the limbus. This was removed and the man was given sufficient vision, so that he could get about.

Hitting a dynamite cap with a hammer will give rise to copper or brass in the eye. Gunshot wounds, shrapnel, B. B. and bird shot are also factors. Broken spectacles, where there has been an explosion. Seltzer water syphons. A woman was injured by the explosion of a seltzer water syphon. It was thought that the glass would not show. She was in the Eye and Ear Hospital for about two weeks and then transferred to the Lying In Hospital and delivered in due course of time. She then returned to the Infirmary to see what the X-ray would show. The X-ray showed a foreign body near the limbus, to one side, and localized it. There was a collection of pus at this particular spot. A loop was used and the glass was removed, the lens not being interfered with. Glass is rather difficult to show, but, fortunately, a piece of glass that can be removed is usually on the edge. When exposed laterally so that the ray traverses the thickest part, the glass shows a thick shadow. Another case was that of a doctor who came down from Bridgeport, who had had an accident. X-ray showed a small piece of glass about the head of the ciliary body. It showed a very faint shadow. To show glass the penetrating power of the tube should not be very good. The removal of this glass was not possible. In Philadelphia they reported the same case as no glass in the eye. A year later he went to Dr. Wilson, who found a bad iridocyclitis and advised removal. Enucleation showed a foreign body in the place where I had located it.

Another peculiar accident which is difficult to understand how it occurred. A negro woman with a perforation of the sclera. She was standing in front of a dry goods store window looking into the window, when suddenly she felt something in her eye. She

came to the hospital with the history of no other accident. There was a hole in the sclera, but no foreign body could be shown. The wound healed without any further trouble. A white woman was walking across Columbus Circle with her husband. Suddenly she felt something in her eye. There was no wind and there were no machines or vehicles passing. X-ray negative. She healed without any further trouble. A man was riding on the front seat of a trolley in Brooklyn and got a foreign body the size of the point of a pin in his lens. Some cases give no history of injury and still foreign bodies are present. A boy 19 years old came in to be fitted for glasses. Examination showed a small opaque spot on the lens and the X-ray showed a piece of metal. Could get no history of accident. The particle was in the lens without having given rise to a cataract.

In these cases we want to know whether an accident has happened, and, if so, what. Get a good history. On Saturday Dr. Reese performed a cataract operation on a boy who came down from up-state with the history that he had fallen on a sidewalk. After he had done the extraction he was not satisfied with the appearance of the eye and suggested the possibility of the presence of a foreign body, and had him flashed over the dressing. This was done yesterday and the foreign body was located in the globe. I have often been asked whether certain things will show in an X-ray picture. Any metallic substance will show excepting aluminum. Pure carbon will not show. Glass will show. As regards the size, it may be anything from a pin point to the size of a breach of a gun. The longest foreign body was  $1\frac{1}{2}$  mm. wide by 54 mm. long. It was the result of repairing the scissors blade for a glove cutting machine. This particle went thru both coats of the eye. The anterior end was very close to the sclera and the other end was in the left sphenoidal sinus. The eye was removed and the foreign body withdrawn.

While demonstrating the slides, Dr. Dixon explained each one. He stated

that wood would show in an X-ray picture only if there was paint on it. He explained the apparatus and the method of plotting the foreign bodies in the eye. With a positive history there should be no failure in taking the picture. One patient had to be X-rayed 9 times before a shadow was obtained on

the plate. He thinks it a great mistake to pull a foreign body toward the center of the cornea. He cautioned against opening the sclera after an unsuccessful attempt at removing the foreign body, until another picture had been taken, as the foreign body may have shifted its position.

## TREATMENT OF INTRAOCULAR FOREIGN BODIES.

JOHN H. OHLY, M.D.

BROOKLYN, N. Y.

Nonmagnetic foreign bodies can often be removed by forceps, or with a hook or with a part of the iris or lens, when embedded therein, or with a mass of exudate, if encapsuled. Last can sometimes be dragged out with a hook along a spatula. For magnetic bodies the magnet is essential. In very recent cases withdrawal may be made thru the wound of entrance, and should be attempted as soon as possible. From the vitreous foreign bodies may be drawn forward with the giant magnet and extracted thru a corneal incision, anterior method. The extraction may also be done thru a scleral incision, after careful localization by the X-ray. The latter method is preferred. Numerous illustrative cases are reported Read before the Brooklyn Ophthalmological Society, Oct. 19, 1923. See p. 222.

In approaching this subject no definite general treatment can be laid down. Each case must be considered carefully and the procedure adopted will vary to meet the special need. First: we must consider the location of the foreign body. Second: ascertain the properties of such foreign body, whether magnetic or nonmagnetic. Upon these two considerations will depend our methods of treatment.

The methods for localization were covered by another speaker, but may I transgress for a moment and emphasize a few diagnostic points? The positive X-ray picture gives definite proof of a foreign body and after accurate plotting its exact location. The negative X-ray examination, however, does not always disprove the presence of a foreign body, for its shadow may be lost in the shadow of the bony parts. Many such cases are reported, and in my own experience this has occurred several times. Therefore let us not neglect the direct examination of the eyeball, using the oblique illumination to ascertain if wounds or scars are present and where located; to carefully inspect the anterior chamber, iris and lens, preferably with a loupe or slit lamp. When the media are sufficiently clear a thoro examination of the vitreous and fundus is essential. A foreign body or evi-

dence of the same can readily be seen in any of these structures.

A history of an accident, especially if metal tools were used, will be most helpful in our diagnosis; but negative history should never be relied upon, other evidences of injury being present. Some of these patients have no recollection of any injury.

### NONMAGNETIC BODIES.

The methods for removal of nonmagnetic foreign bodies such as particles of stone, copper, brass, wood, glass, etc., depend upon their location. When in the anterior chamber and visible, these particles are best removed by grasping them with forceps, the capsule forceps of Fuchs, which have several prongs on the under surface, I have found helpful. It is usually advisable to make a fresh corneal incision in a suitable location, rather than attempt the removal thru the wound of entrance.

Splinters of glass are grasped with great difficulty. A dull iris hook placed behind and under the foreign body and sliding the same over a spatula, enabled me in one case to get a good result. When the foreign body has become imbedded or entangled in the iris tissue, an iridectomy is usually necessary. Foreign bodies in the lens, if not

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too large, can be removed with the opaque lens, often coming away with the lens substance.

When the foreign body is in the vitreous chamber a most difficult task presents itself. It is hard to grasp such particles even when well located or when visible; they are best removed thru scleral incision and by the use of forceps. Serious damage is usually done to such eyes and an enucleation often follows. If the foreign body has become adherent and encapsulated with exudate, it can often be removed when this is drawn from the eye.

Should an eye with a foreign body in the vitreous show no signs of inflammation, and should the vision be fairly good, I would in many instances, be inclined not to interfere, but simply keep the patient under careful observation. Brass and copper particles are not well tolerated in the eye, glass may be retained with almost no reaction.

Some years ago I saw a patient of Dr. Place's. This man lost one eye and seriously damaged the other thru an explosion. Both eyes were cut with glass. After the inflammatory symptoms subsided, a particle of glass was clearly seen in the lower part of the vitreous far forward. This man had normal vision; the glass was not removed and the vision remains normal and the eye shows no sign of irritation.

In another case, while extracting a glass splinter, some 6 m. long, thru a scleral incision, five attempts were made before the foreign body was removed. Each time the splinter was grasped with the forceps, it would slip back into the eye. The damage done to the eye was such that a prompt enucleation followed.

The injuries from B. B. shots fired from an air rifle are serious, especially so when the metal remains within the eye. In one month after the holiday season three such cases came under my observation. Despite city ordinances to the contrary, these dangerous toys are sold and placed in the hands of irresponsible children. The innocent bystander is the one usually hurt. The shot lodged in the vitreous in each of these cases and only in one was I able

to remove the foreign body and save the eyeball with some slight vision.

#### MAGNETIC FOREIGN BODIES.

For the removal of magnetic intraocular foreign bodies a magnet is essential. The choice of the magnet will somewhat depend on the operator and which method of extraction he proposes to use, and his method of choice will again depend on the location of the foreign body. Where the foreign bodies are located in the anterior chamber, in the iris tissue, ciliary body or in the lens, the foreign body is drawn forward into the anterior chamber and then removed.

The small magnets (so called hand magnet) of Hirschberg, Lippincott and Sweet are those most commonly used. Where a greater degree of pulling force is required, a larger magnet is used. These are mounted on stands and supported by counter weights. They are naturally not as easily manipulated. Those most commonly in use are Haab's, Volkman's, Mellinger's and Lancaster's.

In very recent cases and where the wound of entrance has not closed—that is, a few hours after the accident—it is proper to try to remove the foreign body thru the wound of entrance if such wound lies posterior to the ciliary body. Three such cases have come under my observation. When the wound lies in the ciliary region or in the cornea, with or without iris prolapse, I should prefer to remove the foreign body thru a new incision.

These cases illustrate this:

Dr. W. W. aged 30, in May 1913, during his leisure was constructing a coal bin. Striking a hammer with a hatchet, a chip of steel struck his right eye. Accident happened 10:30 a.m., arrived at my office 11:40. X-ray taken 12:30, on operating table at Brooklyn Eye & Ear, 3 p.m. when foreign body was removed. The eye showed a sharp clean cut thru the conjunctiva and sclera, on the nasal side, running obliquely upward, 4 mm. in length, with its inner edge 1 mm from the limbus in the horizontal plane. Diffuse hyphema filling  $\frac{1}{3}$  of the anterior chamber. Hemorrhage in the vitreous



toward the nasal side. X-ray showed foreign body in the vitreous some 17 mm. backward. Placed before the large Haab magnet in such a manner as to exact a direct pull, in a line thru the wound and in the path of the foreign body, the particle of steel 3 x 1 mm. was easily extracted thru the original wound, as the eye was approached to the magnet.

The wound was closed by conjunctival sutures. Vision in this eye was 6/6 when last seen, nine years after the accident.

G. K. a chipper's helper, injured July 1915. A chip of steel flew into the left eye. Seen 2 days after accident. A 3 mm. ragged wound in the sclera and extending 1 mm. into the cornea on the nasal side of the horizontal meridian was present. Pupil drawn slightly to this side, iris was incarcerated and at its base was torn and ragged. Lens cloudy on the nasal side. Small hyphema. X-ray plate showed a foreign body 2.5 x 1 mm., located 11 mm. back, 7.5 mm. below, 1 mm. to temporal side. Under cocaine anesthesia an attempt was made to draw the foreign body thru the open wound of entrance. A large stationary Haab magnet was used. The patient's head was supported by the operator's hands and so turned as to bring the magnet tip, wound and foreign body into a line. The head was brought slowly near the magnet without any reaction or pain. About the fourth attempt the patient brought his head suddenly forward and experienced sudden pain as the magnet touched or nearly touched the wound. As soon as he felt this sharp pain he pulled his head suddenly backward. The current was immediately turned off and the foreign body was found adhering to the tip of the magnet. In being drawn out, however, it became entangled in the iris and as the head pulled backward, tore the iris away from its base and thru the wound. This caused almost a complete aniridia. An extensive hyphemia developed and some bleeding from the wound. The foreign body was larger than expected, 5x2.5 by 1.5 mm. On leaving the hospital the traumatic cataract was increasing, his

vision was 1/36. Dr. Woods reported a similar case in 1907.

Oculists agree on prompt removal in all fresh cases. Some even dispense with the X-ray examination if this causes undue delay. Personally, I always have an X-ray picture taken, not alone to confirm the diagnosis but also to obtain the localization. This always gives me added assurance during the operation.

Now let us consider the removal of the foreign bodies which lie in the vitreous, that is, posterior to the lens; where the wound of entrance is closed or where it is not advisable to remove thru such an opening. This includes practically all these cases.

These foreign bodies can be removed by two well recognized, both valuable, and somewhat different procedures. Namely, by the anterior method; or by the scleral section, or posterior method.

#### ANTERIOR METHOD.

With the development of the "Giant Magnet", which not alone has a greater pulling power, but also a more extended pulling power, some operators, especially Haab, advocated drawing the foreign body forward thru the vitreous, around the lens, thru the suspensory ligment to the back of the iris and thence over the lens thru the pupil and into the anterior chamber. This is the anterior method. Another group of operators, especially Sweet and the Philadelphia School, follow the method advocated by Hirschberg, namely to open the eye thru the sclera to the vitreous and draw the foreign body out by way of the incision. This is known as the posterior method.

The anterior method, as outlined by Haab, is about as follows: The eye is cocaineized and then cleaned with all the necessary aseptic precautions. The patient is then placed before the stationary Haab magnet, his head being controlled by the hand of the operator who stands to the side or in front of the patient. When a small or medium sized foreign body is present, the center of the cornea is placed exactly opposite the pole of the magnet and the patient is told to look directly at the tip of the magnet. If the foreign

body is large, the procedure is changed in that the eye is not brought so close to the tip of the magnet, but the center of the cornea is kept in relatively the same position. Upon turning on the current the foreign body may be seen to appear behind the iris. In the event of this not happening, the current is repeatedly turned off and on. If no bulging of the iris takes place, the eye should be slightly turned to one side so as to bring the more lateral portions of the cornea opposite the tip of the magnet, care being exercised not to draw the foreign body into the ciliary region. When the iris bulges in its periphery, the magnet must be so applied that, by changing the axis of the eye, the foreign body can be drawn thru the pupil and into the anterior chamber. If the foreign body is smooth this can usually be accomplished with comparative ease, but if it is large, with a roughened surface, injury to the lens and entanglement with the iris are often difficult to avoid. After the foreign body is drawn into the anterior chamber it is removed thru a corneal incision. Some use a large magnet for this extraction but most operators prefer the small points of the hand magnet, which is more easily manipulated.

Many minor modifications can be made in this general technic depending on the choice of the operator. When entanglement with the iris has occurred, an iridectomy is usually advisable. With large magnets suspended from the ceiling, or mounted on stands by counter weights, it is advisable to have the patient on the operating table and move the magnet instead of the patient's head.

These few cases will illustrate this method:

H. O. came under my care June 20, 1922. While hammering a lathe, a particle struck his left eye. A small penetrating wound in the cornea, below the limbus at 5 o'clock and a small hole in the iris could be seen. The lens was clear. The X-ray picture showed a foreign body shadow  $\frac{1}{2} \times \frac{1}{2}$  mm. 8 mm. back,  $6\frac{1}{2}$  mm. below and 7 to the temporal side from corneal center. The

magnet placed on the corneal center promptly pulled the particle forward, and with very little manipulation it was drawn into the anterior chamber. A keratome was used to open the anterior chamber below, and with hand magnet the foreign body was easily removed. Uneventful recovery with normal vision. When last seen this man had normal vision some 18 months after operation.

A. B. Mechanic, age 23. In February 1921 came under my care. Struck in the left eye with a piece of steel four hours before admittance to hospital. A clean cut wound to outer side from limbus, slight subconjunctival hemorrhage, no hyphema and lens was clear. X-ray showed foreign body 12 mm. back, 6 mm. temporal and 6 mm. below horizontal plane. The foreign body appeared to be  $2\frac{1}{2}$  by 1 mm. in size.

The man was placed on the operating table and large magnet used. On applying the current the iris bulged on the temporal side; by turning the eye the foreign body was drawn over the lens surface into the pupil and without difficulty into the anterior chamber. The foreign body was then removed by corneal incision. It proved to be  $4\frac{1}{2}$  mm. x 2 mm., was very ragged on one surface and perfectly smooth on the other flat surface. Two days later a lens opacity was noted, which was caused by the rough sharp surface injuring the lens. The lens was finally extracted, and with correcting lens  $\frac{6}{9}$  vision was obtained. I believe in this case had I extracted the foreign body by the posterior method, the man would have had a more useful eye. The size of the foreign body was much misjudged.

H. B. Mechanic, age 35, striking a bolt with hammer and chisel had an injury to his left eye. Came under my care 3 hours after accident Oct. 31, 1921. A 3 mm. horizontal cut in the cornea above and a horizontal cut in the iris were clearly seen. The lens was becoming opaque and a slight hyphema was present. In the vitreous considerable hemorrhage. X-ray was taken, but did not wait for localization. With large magnet the particle was

drawn into the anterior chamber. It emerged thru the iris hole and partly became entangled in the iris. An iridectomy was done and the foreign body easily removed. The foreign body measured about  $4 \times 1 \times 1\frac{1}{2}$  mm. There was considerable reaction; an iridocyclitis developed; the swollen lens also kept the wound from closing. The lens material was removed, but the eye remained irritable. Thick bands of exudate could be clearly seen in the vitreous. The eye became soft and remained irritable. V=Light, with faulty projection. Enucleation was advised repeatedly, but it was refused. Last seen in June 1922, when he had a beginning phthisis bulbi. The foreign body probably carried the infection into the eyeball. The bands in the vitreous caused retinal detachment and blindness. Had the posterior method been used, some might have attributed the result to this procedure.

#### POSTERIOR OPERATION.

The extraction of the intraocular foreign body thru a scleral incision is called, as before stated, the posterior method. This is only applicable to the foreign body posterior to the lens. Hirschberg was one of the first advocates of this method, which was about as follows: The patient was given a general anesthetic and the eye held and turned by a suture placed thru the conjunctiva near the corneal margin. A large conjunctival flap was made, including some of Tenon's capsule over the proposed site of the incision. A meridional incision was then made, some 5 to 7 mm. long thru the conjunctiva near the equator, below and to either side of the inferior rectus. The sclera was punctured with a double edged Graefe knife, the opening enlarged as required. The incision was held open with a small tenaculum and one of the large tips of the hand magnet placed against the incision; if the foreign body was not extracted one of the smaller tips was used, and this entered into the incision in the supposed direction of the foreign body. That is supposed direction of the foreign body because most of Hirschberg's cases were not localized by X-

ray. The instruments used, with the exception of the magnet, were made of nonmagnetic metal. If the vitreous prolapsed it was cut off. The incision was closed by silk sutures, the sclera not being sutured. The patient was kept in bed for one or two days and remained in hospital 2 to 3 weeks.

At present with our exact methods of localization it is possible to open into the vitreous at almost the exact point, or very near, the location of the foreign body, thus lessening the trauma. The conjunctival flap is now much smaller and only covers the site of the scleral incision. It is advisable to include all the subconjunctival tissue, and leave the sclera free from tissue; thus hemorrhage will be avoided and the operating field remain clearly visible.

In making the scleral incision I use an ordinary Graefe knife; puncture the sclera and enlarge the opening as the knife is drawn outward. The length is usually 3 mm., depending on the size of the foreign body. At the center of the first incision a second incision is made at right angles, some 2 mm. in length, this gives a T shaped opening. The knife should never be plunged into the vitreous.

In introducing the tip of the magnet it should be so placed that it lies between the lips of the incision, and then the current is repeatedly turned on and off. Should the foreign body not adhere to the magnet, the tip can be entered into the vitreous not more than 1 or 2 mm. and the procedure repeated. Upon no occasion should the magnet point be entered 8 to 10 mm. in the vitreous, and moved about in a sweeping manner, if any useful vision is expected. I believe that due to faulty technic this method has been discredited by some oculists. I have used this posterior method in some 20 cases and failed to see where the operation did any additional serious damage to the eye, or where as a result of the operation the eye was lost. In no case did retinal detachment occur.

These few cases illustrate this procedure.

On June 30, 1919, Theo. E., age 20, mechanic, came under my care. Four

days before, while dulling a piece of steel, a particle flew into the left eye. To the nasal side, adjacent to the limbus, a 2 mm. horizontal scar with subconjunctival hemorrhage was present. The pupil not affected. Vision 6/6. The media was clear. Below and to the inner side from the neervehead some disc and a half diameter, a sharp cut in the retina and choroid was clearly visible. Thru this the white sclera glistened. Several hemorrhages were present in the retina. At this site no foreign body was seen. The foreign body was 13 mm. back, 9 temporal, 8 below. This particle entered the eye, struck the sclera, did not pass thru the eye but rebounded forward into the vitreous, where it lodged. Foreign body removed thru scleral opening. It was not necessary to enter the vitreous with the tip of the magnet, simply placing same into the incision. Wound closed with conjunctival flap placing two sutures. The resulting vision June 1923, four years later = 6/6. The site of the scleral and choroid injury showed a light red area surrounded by deep black pigment.

J. G. Age 26. Under observation May 24, 1915. Stated that in August 1912, while straightening a piece of tin with a hammer, something flew into his right eye. Went to a clinic in a general hospital. Complained about floating spots before his eyes. Two months later was received at B.E. & E. Hospital. An X-ray picture gave negative results. Twenty-one months after the accident this eye showed signs of inflammation. The lens was somewhat cloudy near its posterior pole and in the periphery. The iris was the same color as the other eye and reacted promptly. On or under the lens capsule a few light brown circular spots suggested a beginning siderosis bulbi. There were no Descemet's deposits; the fundus appeared normal; no detachment and no vitreous opacities. V. — 27/70, the reduced vision being due to the lens haziness. There was no scar of the injury visible. The left eye was normal.

Altho there was a history of a negative X-ray picture, taken by a compe-

tent radiographer some twenty-one months previous, as a matter of routine the patient was placed before a large Haab magnet and several unsuccessful attempts were made to extract a foreign body or attain any pain reaction.

Patient returned on January 29, 1916, eight months later. He stated that he could only see light with the right eye. V. — hand movements. The lens was now completely opaque. On the lens capsule, midway between the center and periphery, numerous circular, light brown deposits were arranged in the shape of a ring, in or under the lens capsule. The iris was discolored, dark brown with a reddish tint. The other iris was light brown. A case of siderosis bulbi, probably due to a retained foreign body. A radiograph taken showed a foreign body 9 mm. back of the center of the cornea, 10 mm. below the horizontal plane, and 3 mm. to the nasal side of the vertical plane. The patient was again placed before the Haab magnet, but with no result.

On February 11th, under cocain anesthesia, a conjunctival flap was made 4 mm. below the corneal margin and 3 mm. to the nasal side; a crossed incision was made in the meridional line. Thin watery fluid exuded from the eyeball—some five to ten drops. The tip of the hand magnet was introduced between the lips of the wound repeatedly, but with no results. The incision was enlarged some 2 mm. and various tips were introduced a little deeper, but with no results. The dull-pointed scissors were attached to the magnet (as advised by Jackson); careful and repeated small cuts were made in the tissue under the incision; the vitreous was entered some 3 to 4 mm. After repeated attempts the scissors were withdrawn, but no foreign body appeared. The magnet tip was again inserted and upon being withdrawn, the choroid came up into the wound, with the foreign body retained under it. It was difficult to disentangle the foreign body from the choroid, as no undue traumatism was desired. The foreign body was 1.5 mm.  $\times$  1 mm. at its widest points, very ragged, and the



edges crumbled away in the hand, leaving it about half its original size. There was practically no reaction. Tension remained below normal for several days. V.= hand movements; light projection good.

On February 21st a combined lens extraction was done, the eye healing with little reaction.

March 11th: No signs of inflammation. V.=sph. + 11.0  $\ominus$  cyl. + 1 axis 180° -6/9. Field normal; some vitreous opacities.

In March 1923, Mr. L was referred to me by Dr. M. A history of a foreign body having entered the eyeball. No scar in the cornea, cut in the iris, some lens opacities near front. The injury had occurred some weeks before. The eyeball showed slight signs of irritation. A foreign body had been localized in the vitreous, just posterior to the ciliary body. Man was placed before the large magnet and long and persistent attempts were made to draw the foreign body forward with no results. This was again tried on the two succeeding days. Finally a scleral incision was made near the site where the foreign body had been localized, and it was removed with the hand magnet without any difficulty. The recovery was uneventful. His doctor informs me his vision when last seen was 20/200, due to increasing lens cloudiness and changes in the macula region.

Intraocular foreign bodies are serious eye injuries and our prognosis should be most guarded. The patient or his friends should be warned of the possible serious results. The foreign body may be the carrier of infection resulting in iridocyclitis or panophthalmitis. The injury caused by the accident is often serious, especially when the ciliary region is involved and to this is added the trauma of the operation. Even after the successful removal of the foreign body, postoperative and inflammatory changes may bring to naught what seemed a splendid result.

Sweet states that from his experience about  $\frac{1}{3}$  of the eyes are lost, due to primary infection, retention of the

foreign body and late iridocyclitis, and even when the foreign body is most successfully removed, only a few secure useful vision.

Excluding the cases which were lost from infection and iridocyclitis, I secured useful vision in over 60%. The reason for this result I believe may be due to early operation.

Derby also strongly advocates an immediate operation and feels this is most essential for a successful result. In his work at the front during the World War, when many hundred cases came under his observation, he often placed these cases before the magnet without taking X-ray pictures. He relied upon the magnet as a diagnostic aid, namely in testing for the pain reaction.

Where the foreign body has been within the eyeball for weeks or months a delay is not harmful.

The postoperative treatment consists in bandaging both eyes the first 24 to 48 hours, rest in bed and reasonable quiet. The eye is dressed daily, atropin usually instilled and some mild antiseptic as argyrol or mercurochrome used. The complications that arise must be treated accordingly. When primary infection has occurred the resulting inflammation must be vigorously fought. Large doses of salicylates and free diaphoresis may be helpful. Antidiphtheritic serum can also be tried. When panophthalmitis results I enucleate promptly, especially if the foreign body has remained in the eye.

In the cases where an extensive injury has occurred and when the eye remains irritable for weeks after the operation, an enucleation may be advisable. I personally have never had a case of sympathetic ophthalmia follow an intraocular foreign body, but have had several follow other injuries. In compensation cases when these eyes are blind, and when some slight irritation persists, I have been inclined to "play safe" and remove the eye rather than "watchful waiting". This class of people are likely to pay little attention to their ailments (after compensation has been settled) and they are difficult to keep under observation.



The question as to which method, the anterior or the posterior, offers the best results in the removal of foreign bodies from the vitreous is undecided. There are ardent adherents of each method, their opinions being justly based upon results obtained by long and rich experience. Both methods give their good results and also their failures, the failures often being caused by circumstances beyond the control of the operator.

The advocates of the posterior method claim that this procedure produces less trauma and when properly carried out is comparatively simple and usually successful. There is no danger of injuring the lens or entangling the foreign body in the iris or ciliary body; also that by this method the foreign body need not make a second long excursion thru the eyeball in being extracted.

The advocates of the anterior method claim that by this method the trauma is less and the danger of infection is not so great as when the vitreous has been opened. They further claim that corneal wounds heal more readily than incisions of the conjunctiva and sclera and that the danger of choroidal hemorrhage, retinal detachment and interference with nutrition of the vitreous is much less.

My own conclusions are based upon experience in some 40 intraocular foreign body cases. I operated by both methods. I also had the opportunity to observe some 20 cases of other operators. All these cases were at the Brooklyn Eye and Ear Hospital. I have seen no wound infection and think this due to a proper conjunctival flap. The sutures should be so placed as not to lie close, or in contact with the underlying scleral incision. Very rarely have I had a vitreous prolapse. This I think can be avoided by making a small scleral incision. As stated before, I have seen no cases of retinal detachment which could be attributed to the operator. When this does occur I believe it is due to the contraction of bands of exudate extending from the original site of injury into the vitreous along the path which the foreign body

had taken. In several cases such bands were seen.

Several times traumatic cataract developed in drawing a foreign body forward over a clear lens. In some 6 cases in which I tried to remove the foreign body by the anterior method, I failed, even after repeated attempts. In two cases four attempts were made on successive days without any result. In each case the foreign body had been located in the vitreous back of the equator of the eye. Two were fairly recent, 5 to 6 days after the accident.

Two were some weeks, one 2 years after the injury and the other 5 years after the eye became blind, there being no history of accident in this case.

In the last two cases a diagnosis of intraocular foreign body was made by the presence of a siderosis bulbi. All these six cases subsequently had the foreign bodies removed by the posterior method without any difficulty, and in only one case was it necessary to do more than enter the tip of the magnet into the wound. My failure may have been due to a magnet of insufficient strength or perhaps to faulty technic, altho I have extracted quite a number successfully by the anterior method.

In some cases the foreign bodies were not removed by either method. In two cases the particle of steel proved to be only very slightly magnetic (nonmagnetic) probably being an alloy of magnesium. In one recent case the foreign body was embedded in the sclera, having fully perforated it, near the entrance to the optic nerve. The enucleation proved this, the X-ray plotting had given a wrong idea of its location.

In several cases the cause of failure must have been due to firm encapsulation of the foreign body. Some foreign bodies become firmly embedded, especially when a moderate inflammatory reaction follows, and when these particles have been long within the eyeball.

Dr. Jackson has devised a method to be used when the foreign body cannot be removed, due to its being encysted by exudate. He introduces the

point of a sharp cutting scissors into the scleral incision, the scissors being in contact at its joint with a strong hand magnet. With the current turned on he makes repeated short cuts into the underlying tissue in the direction of the foreign body, thus opening a path to the same. He reports several cases with successful results. As before stated, this helped me in one case. Magnetized forceps and tenotomy hooks introduced into the vitreous I have not tried, and do not consider this especially good surgery.

Some months ago a man came under my observation who had a foreign body injury some 4 to 5 months previous. He had had several X-ray pictures taken. Also several attempts had been made to remove this foreign body without success. In the fundus a white

exudate, surrounded by scanty pigment, about half the size of the nerve-head was seen. This was located some two disc diameters temporally to and below the optic nerve. On looking into this fundus with the ophthalmoscope and on applying the large magnet near this eye, a distinct movement could be seen under the exudate. Here was an encapsulated foreign body. I tried daily for a week to loosen this foreign body by applying the large magnet, but failed. The man would not consent to my opening his eyeball and attempting to remove it by the posterior route. He had a vision of 6/12 in this eye.

In conclusion I would state that I have been more successful in removing the foreign bodies from the vitreous by the posterior route and would advise using this method.

## NOTES, CASES, INSTRUMENTS

### UNILATERAL CONGENITAL PTOSIS CORRECTED BY THE HUNT-TANSLEY OPERATION

CLARENCE LOEB, M.D.

CHICAGO, ILLINOIS.

R. R., first seen at the Michael Reese Dispensary, June 7, 1923. Examination showed a congenital ptosis left upper lid, with paralysis of the superior rectus, inferior rectus and inferior

oblique. Movement of eye temporally, nasally and downward good. No movements upwards. The patient was chiefly interested in having the position of the lid improved, but it was explained that this would probably not improve the cosmetic appearance, on account of the position of the eye, while it might add a diplopia to her trouble. I suggested that an attempt be made first to improve the upward movement of the eye, and she was referred to the



Fig. 1. Ptosis appearance before operation.



Fig. 2. Result of Hunt-Tansley operation.

Michael Reese Hospital for this purpose.

The surgeon on service performed a transplantation of the recti, but, as frequently happens, the improvement was not marked. She was kept under observation until Sept. 21, when she was readmitted to the hospital on my service. Unfortunately an acute conjunctivitis developed, but I was able to operate on October 2. Under general anesthesia, I did a Hunt-Tansley, with the result that the patient now presents. If you will compare the present condition with the photographs, you will see that there has been a decided improvement in the cosmetic appearance, and the malposition of the eye is visible only when the palpebral orifice is greatly widened. As to the latter, altho before the operation she could barely move the lid, at the present time the connection with the frontalis permits her to open the left eye almost as well as the right. The supraciliary scar is barely noticeable, and the palpebral scar lies in the normal wrinkling of the lid.

### ANNULAR GUMMATOUS CONJUNCTIVITIS.

C. V. LUNDVICK, M.D.

CHICAGO, ILLINOIS.

The patient entered Cook County Hospital June 23, 1923, on Dr. Geo. F. Suker's service; stating that on June 20, 1923 she was seized with a constant and severe occipital headache. On the following morning, the left eyelids became swollen and hot, associated with a continuous thumping pain. Lacrimation became rather marked but patient noticed no purulent discharge. No chill, no nausea, vomiting or cough were present at the onset, but patient states that she felt feverish.

Her general condition remained about the same upon entrance to the hospital but an edema of the entire left bulbar conjunctiva became progressively more marked. This was a solid edema of numerous uniform nodules completely surrounding the cornea—nodules, not unlike cobble stones (1-3mm.), causing a distinct faceted

elevation around the entire limbus and extending to the culdesacs. These nodules were of a brick red color, not greatly vascularized.

Past history both medical and surgical is negative, except for an attack of acute rheumatic fever ten years ago with swelling of both ankles. Personal History is negative except for obstetrical which is as follows: One full term child died at five years of measles. Second pregnancy was a miscarriage at three months.

Venereal infection, both gonorrheal and luetic was denied, but patient has had profuse leucorrheal discharge for the past ten years. There were no enlarged glands, either preauricular or along sternocleidal muscle. General physical examination negative.

The movements of the eye were good in all directions except slightly decreased mobility upward, but there was no diplopia when the eyes were turned upwards. Ophthalmoscopic examination showed the entire vitreous medium to be hazy so that the optic disc, retina and vessels were blurred.

The right eye appeared normal.

Repeated laboratory examinations of conjunctiva showed only polymorphonuclear leucocytes. No bacteria. Conjunctival cultures were negative. Blood count, Reds 3,750,000, whites, 14,000. Spinal fluid Wassermann was negative. Blood Wassermann was negative. Temperature 100.2. Pulse 94. Respiration 22. Blood pressure, 120/74.

On June 26th, patient was seen by an attending man, who considered Parinaud's conjunctivitis to be the most likely diagnosis. On July 1st, services changed and the essential findings in the left eye were as noted above.

Vision: R. E. 20/20; L. E. 20/40.

On July 11th, patient was put on mercury rubs and potassium iodid.

On July 17th condition was slowly improving.

On July 19th there was very marked improvement and Dr. Suker made a clinical diagnosis of annular gummata of the conjunctiva.

On July 24th, patient was discharged with a perfectly clear conjunctiva and it has remained normal up to date.

## MUCOCELE OF ETHMOID WITH PROPTOSIS OF RIGHT EYE.

RICHARD L. BOWER, M.D.

CHICAGO, ILLINOIS.

The patient, Philip W., entered the Cook County Hospital, August 8, 1923, on the service of Dr. G. F. Suker, complaining of bulging of right eyeball and pain in the region of right orbit.

He stated that he has had present

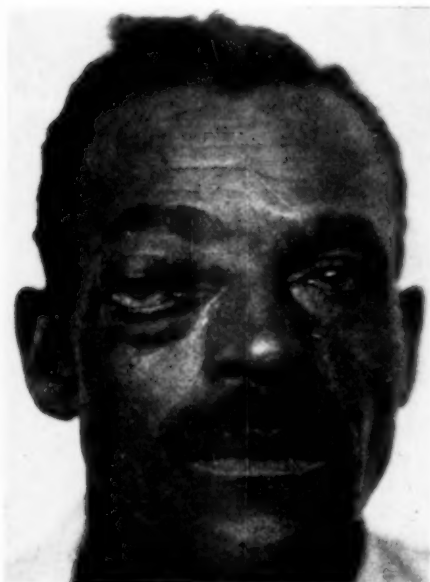


Fig. 1. Mucocoele of ethmoid causing proptosis.

trouble for the past ten years. At periods covering a week or two, the right eye protrudes, and accompanying the protrusion there is pain in the orbit and over the bridge of the nose. The protrusion is generally associated with a cold in the head, and as this clears up the protrusion and pain become less marked, altho at no time during the past ten years has the right eye appeared to be in its normal position.

The present attack came on ten days ago with a cold and discharge from the nose and pain in the right eye, dull and constant in character. Blowing the nose made the protrusion of the eye more marked. Past and family history essentially negative. Venereal history negative.

Physical examination revealed a well nourished colored male of about 45

years of age, with marked protuberant right eyeball.

Examination of eyes revealed (see Fig. 1): Left eye, normal—vision 20/20.

Right eye; Position, exophthalmus of 7/16 of an inch, as compared with the left eye. Movements limited in all directions, with diplopia when looking to either right or left. Lids normal, no lagophthalmus. Cornea and media normal. Fundus normal except for a partial optic atrophy primary type. Vision—fingers at five feet. There is a marked fluctuating swelling in the inner angle of orbit. No crepitation noted. Pressure on swelling causes pain and added exophthalmus.

Examination of nose: Septal deviation to left, with enlarged right middle turbinate. No pus seen in the nose. X-rays showed defective right ethmoids, and right frontal cell showed slightly less clear cut border in frontal projection.

A diagnosis was made, and confirmed by Dr. Suker, of mucocoele of right ethmoid. Blood Wassermann negative. Blood count, whites, 9,600; reds, 4,800,000.

The patient was operated upon three days after admission, when a Killian operation was done. The frontal sinus was found to be normal. A bluish, encapsulated, fluctuating mass occupied the inner portion of the orbit, and was connected with the ethmoidal region. It extended along the inner wall of the orbit for at least an inch, and was ruptured when an attempt was made to remove it. The fluid, which was mucoid in character, was removed and the cavity gently curetted. The lamina papyracea was removed and the ethmoids exenterated. Tubal drainage, together with gauze packing, was introduced in the cavity and brought out thru the nose.

The incision closed with no drainage externally. The patient made an uneventful recovery, and drainage was discontinued after three weeks. Patient was discharged from hospital free from pain, and exophthalmus much less, measuring 3/16 as compared with normal eye.



# SOCIETY PROCEEDINGS

Reports for this department should be sent at the earliest date practicable to Dr. Harry S. Gradle, 22 E. Washington St., Chicago, Illinois. These reports should present briefly scientific papers and discussions, include date of the meeting and should be signed by the Reporter or Secretary. Complete papers should not be included in such reports; but should be promptly sent to the Editor, as read before the Society.

## SAN FRANCISCO COUNTY MEDICAL SOCIETY, EYE, EAR, NOSE, AND THROAT SECTION

October 23, 1923.

DR. E. F. GLASER, Presiding

### Melanosis of the Conjunctiva.

DR. LOUIS C. DEANE said that the most noticeable feature of an eye is its pigment, it matters not whether you be a layman or an ophthalmologist. If you be an ophthalmologist, it is the ophthalmoscope and not the microscope that really interests. It is the pigment that one sees with the naked eye. Its remarkable distribution, its normal variations in quantity and location, and again, its spectacular feature, lying there without apparent function, except to curb or retain the light rays, it can by some unknown process culminate into a growth so malignant as to claim at least an eye, if not a life. This is so of any part of the eye where pigment normally exists, whether choroid, ciliary processes, or iris. Pigment can creep into parts where it does not belong, and in such places it becomes a greater menace in that, with the tissue it has invaded, it may assume a tumor form and in most instances a malignant form.

Pigment is not present normally in the conjunctiva or sclera. The limbus seems to be the connecting link between the pigment or the uveal tract and epibulbar region, for it is here that in the colored race we see a ring of pigment encircling the cornea, and it is in this region that the melanosarcoma of the conjunctiva is seen.

Mrs. H.—middle aged woman, always good health. Twenty-five years ago, noticed in the right eye some diffuse brownish spots in the white of her eye, gradually increasing until they became coalescent. She states that the amount varied, increasing in quantity following excessive use of eyes or general fatigue.

I saw her first in February of this year. She consulted me not for the pigmentation, but for a small growth on the eye that had been increasing in size for nine months. The first thing noticed was a diffuse brownish black pigmentation of her entire ocular and palpebral conjunctiva extending onto the cornea for a couple of millimeters on its surface epithelium. A growth about 6x4x3mm. was situated at the outer limbus in the horizontal meridian, deeply pigmented and movable, except for its proximity to the cornea.

The fundus showed no variation from normal, the iris was similar in color and appearance to the left eye and the cornea was normal except for the slight encroachment of pigment at its edge. Vision 20/20 and always the better eye of the two, she states. The tumor looked malignant and I extirpated it, including surrounding conjunctiva, and cauterized the underlying sclera, bringing the conjunctiva together with stitches. The wound healed as after a pterygium operation, and there has been no recurrence.

While cleansing the eye with cotton previous to the operation, I was astonished to find that I could wipe off the pigment from the conjunctiva, staining the cotton swab quite black. I repeated this on the following days and could always wipe off pigment.

Dr. Ophuls of Stanford University states that it is a nonmalignant growth; diagnosis, melanosis of conjunctiva.

Since the operation, nine months later, the amount of pigment in the conjunctiva has markedly diminished, only appearing now in large circumscribed patches. She states that this diminution has occurred before.

The following thoughts seem to be of interest:

1. The varying intensity and quantity proving an active process of pigment proliferation.

2. Is the diminution of pigment due to absorption, or is it just wiped or

washed off by the action of the lid? I was able to remove some by a dry cotton swab.

3. It would seem that the activity of pigment production, and recession, has no bearing upon malignancy, as this tumor proved contrary to the rule.

4. Excluding congenital conjunctival nevi or moles, or brown pigmented spots seen in dark people, any melanosis of the conjunctiva, no matter how mild, is very likely to develop into malignancy.

Fuchs states "that in most cases melanosarcoma develops." Weeks prefers to remove such spots surgically before waiting for further developments; Verhoeff and Loring say 80 per cent in favor of malignancy.

*Discussion.* K. PISCHEL remarked that in his experience it was the first case of its type he had seen; especially interesting was the fact that the pigment could be brushed off so easily.

OBARRIO was interested in two points. The wiping off of the pigment is due to proliferation of pigment cells. Also there was 60% more pigment present before operation, he having seen the case. He does not understand why removal of the tumor has stopped pigment proliferation unless due to the changing of vascular supply. The pigmentation has been receding ever since the operation. In 1903 he reported a case of marked pterygium, and pointed out that if the blood vessels of the conjunctiva in healing turned upon themselves and did not ramify on the cornea there was no recurrence. In this case that has taken place, and so he thinks there will be no recurrence.

W. S. FRANKLIN pointed out that melanosis is rare. We have nevi or circumscribed tumors of the iris that are considered congenital. He feels that subconjunctival injection might hasten absorption of this pigment.

M. W. FREDRICK feels that pigment must have broken thru to allow wiping it off.

DEANE in closing quoted Ophuls' report, "the upper layers of the epithelium are missing," and perhaps this accounts for the fact that the pigment can be wiped off.

### Cataract Extraction Technic, With Reference to Antisepsis and Iris Anesthesia.

DR. P. DE OBARRIO reviewed cataract classification, observing that we should strive to determine two important factors: thickness of the capsule and size of the nucleus.

The slit lamp gives most valuable information but its expense is prohibitive. The author uses the telescope of an ordinary ophthalmometer, and by projecting a strong light directly on the anterior segment of the patient's eye and omitting entirely the mire lights, a lot of valuable information can be obtained as to condition of iris, lens, capsule, etc. The double image produced by prisms is eliminated by removing the same or by moving observer's eye to one side.

He makes a special point of the use of rubber gloves. Hands must be dry, glove fingers short and well fitting over tips. Avoid powder outside of gloves. When gloves are on, wet with bichlorid and just dry excess of liquid; this procedure gives necessary cohesion to instruments. Instrument handles should be preferably octagonal, as they give feeling of being "geared" to fingers. There is no appreciable loss of feeling with gloves.

He lays particular stress on use of mouth and nose cover for operator and assistants, and shows culture plates and tubes of result of experiments on exposure of operation field for five minutes, under mouth and nose protection as well as without it, showing great increase in number of colonies as compared with check plate cultures. The conjunctiva is never sterile; the principal organisms present are xerosis bacilli, from 80 to 94%, and staphylococcus albus, from 70 to 85%, both of which are not necessarily pathogenic. Real danger of traumatized cornea is in the presence of the pneumococcus, which can not migrate thru the nasal duct of patient because of ciliated epithelium of same. If present, it must have been transplanted by hands, instruments, or by the action of speaking into the field of operation without nose and mouth protection. There is no excuse for not taking all precautions,

otherwise the operator may be legally liable.

Absolute iris anesthesia is produced by direct instillation of 4% novocain with adrenalin into the anterior chamber immediately after corneal section.

He explains the mechanism of his method of lid traction to produce minus pressure on the globe during operation. Claims lid traction to be the greatest factor of safety in ocular surgery and by far the most important advance in the technic of cataract extraction. Technic is based on clinical observation that eyes in which the cornea collapses after section, never produce vitreous loss. Author endeavors to produce this condition of minus tension artificially in all eyes, to prevent vitreous loss as well as to assist in the replacement of the iris, or the management of vitreous prolapse.

Very special stress is laid on the clinical fact that traction on the zonula can be exercised to a very great extent without producing reaction. On the other hand, compression in the neighborhood of the ciliary region to expel a lens produces considerable reaction. Intracapsular extractions by expression methods invariably produced irritable slow healing eyes. Intracapsular extraction by traction produces considerably less reaction and frequently no reaction. Traction on zonula can be produced to an extent that may appear alarming, without reaction and without vitreous loss, if coupled with lid traction in accordance with the author's technic.

*Discussion.* W. S. FRANKLIN remarked that the paper had some very practical suggestions. The reason for so few infections in cases of poor technic is probably due to the washing away of the bacteria by the aqueous. We can not use strong enough solutions to sterilize the conjunctival sac without injury. In the lavage it is really a mechanical cleansing. He has worn gloves in every case for the past ten years and finds it does not interfere with the sense of touch, provided gloves are worn in every case. He feels that operating without a speculum is safer and easier on the patient.

C. MAGHY pointed out the necessity of determining the type of cataract.

M. W. FREDRICK feels that a new knife is necessary in every case. He has seen Obarrio operate using the iris anesthesia and saw that it worked well. However, the fewer instruments put into the anterior chamber the better the result and the less danger. He also feels that the advantage gained does not warrant the additional risk. He could not become accustomed to gloves, and in as much as the part of the instrument entering the eye is not touched he sees no necessity for same.

K. PISCHEL remarked, that in Axenfeld's clinic, if the examination of the conjunctival smear showed staphylococcus aureus the operation was postponed. The use of codein before the operation is a great help, as is also the paralysis of the orbicularis as described by Derby at the last A. M. A. Subconjunctival injection helps sufficiently so that intraocular instillation of cocain is not necessary.

OBARRIO in closing wanted to emphasize the holding up of the lids to produce a minus tension, and also the wearing of gloves and a mask to guard against any outside infection.

FREDERICK C. CORDES,  
SECRETARY.

Tuesday, November 27th, 1923.

Dr. Edward F. Glaser, Presiding.

#### Postgraduate Work in Vienna.

DR. WARREN D. HORNER presented a paper on the present aspect of postgraduate and clinic work in Vienna. The author reviews conditions in Vienna as he found them in an eight months' stay at the eye, ear, nose and throat clinics from September, 1922, to June, 1923.

The importance of the American Medical Association of Vienna to the visiting physician is emphasized. This Association, which is more than twelve years old, maintains club rooms near the hospital. These serve both as a bureau for postgraduate courses and as a social center for all visiting English speaking physicians. The membership runs from 100 in the winter months to about 250 in the summer.

The Association is now up to its pre-war strength and effectiveness. The President, Dr. Bernard Kaufman of

San Francisco, deserves to be congratulated for his excellent work during the reconstruction period. Courses of study are cataloged and announced by or thru the Association, which has arranged with the faculty for a standardized fee system. It also acts as financial agent for both student and instructor. The listing of available courses and the standardizing of their fees is of the utmost importance to the visiting physician. Practically all courses may be had in English, but a knowledge of German is naturally of great advantage. A wide variety of work may be had at the various hospitals, clinics and institutes.

Prices for instruction run from three to five dollars per hour for lectures or demonstrations, and from fifteen to fifty dollars per month for clinic work depending upon the amount of individual instruction given. The fee is divided equally among the men taking the work, and all fees are quoted and paid in dollars.

Operative work on the cadaver is plentiful and good. Operations on the living are only obtained after months of work at the same clinic or perhaps in a few cases by private arrangement with some surgeon.

Owing to the low value of the kronen and the small fee obtainable for an office visit, teaching Americans for American dollars has become unusually popular among the faculty. Many of the Austrian faculty underrate American knowledge and methods in medicine. They are perhaps influenced in this view because so many Americans go to Vienna for postgraduate instruction. However, those of the faculty who have been to America are enthusiastic over what they saw and give us the full credit that we deserve in the medical sciences. The Austrian can not understand the common practice of so many of our best men devoting their entire time to private practice. The Austrian physician prefers the honor and title incident to a university clinic appointment more than a larger private practice. This makes for better postgraduate facilities there, and is one of the funda-

mental reasons why postgraduate work is better in Austria than in America.

Living conditions are good in Austria. Living costs are lower than in America; good pension board, room and service may be had for example at about forty dollars per month. Other items are proportionately low.

Austria's general political and financial condition is improving steadily, due to her own efforts and the stabilizing effect of an allied loan.

Vienna offers many attractions to the visitor, outside of medicine, in the beauty of its public buildings, its parks, its operas, and its picturesque surroundings.

FREDERICK C. CORDES,  
SECRETARY.

### BROOKLYN OPHTHALMOLOGICAL SOCIETY.

OCTOBER 18, 1923.

DR. JOSEPH E. GOLDING, President.

#### Intraocular Foreign Bodies.

Papers on this general subject were read as follows:

Dr. Walter B. Moore, "History of Methods of Diagnosis and Treatment". See p. 204.

Dr. George S. Dixon, New York, "Detection and Localization of Intraocular Foreign Bodies". See p. 206.

Dr. John H. Ohly, "Treatment of Intraocular Foreign Bodies". See p. 208.

*Discussion.* DR. SMITH: It is instructive and broadening to have the history of this important subject brought to us by Dr. Moore who traced the steps by which the advances have achieved.

Of course, Dr. Dixon's name implies always an interesting program. Dr. Ohly brings us to the practical consideration of the question. My experience agrees with his as to the value of and preference for, the posterior route, unless the injury is very recent and the foreign body is in the anterior segment of the globe. I have never failed to extract a foreign body by the posterior method after it had been localized.



I believe that many of the eyes eventually go bad after a few years. They are so often followed by a low-grade iridocyclitis, shrinking of the globe; and finally come to enucleation.

DR. RALPH I. LLOYD: The first question that comes to my mind when discussing foreign bodies is, "How small may a foreign body be and total enough force to penetrate the eye?" The smallest foreign body which I have removed from within the eye was weighed by a chemist on a very delicate scale and found to weigh  $1/92$  of a grain. That would seem to approach the ultimate.

I made some experiments to determine the effects of the magnetic pull on foreign bodies of various sizes; ( $1/92$ gr.,  $1/9$ gr.,  $1/5$ .) under various conditions. On a dry surface, the magnet exerts about the same pull, the size making but little difference. In water, they jump along nicely and work out about the same. I tried egg albumen, a medium nearly approaching the vitreous, and I found extremely interesting facts. The magnet acted with extreme slowness; the foreign bodies drawing up along with them a large mass of egg albumen. When the current was turned off, the foreign body resumed its original position, being drawn back by the elasticity of the tongue like mass attached to the foreign body. The smaller pieces were handicapped much more by the attached mass than the larger one.

There is a polarity to these pieces, they will do the same things each time. The larger end, (we will say), will turn first and then advance to the magnet. If the other end is toward the magnet, there will be no turning unless the direction of the current is changed. It may be that the contact with the magnet at the time of extraction, polarizes it. An important question, then is, Does the thickness of the end cause polarity or does the magnetic contact produce it?

I am compelled to agree with Dr. Ohly about the posterior route. I had five cases in the past year which did not come out anteriorly, but did by the posterior method. There seems to me to be no great danger in going into vitreous deep enough to get the foreign bodies. In any event, if one must go into the vitreous,

why hesitate? We must have the foreign body if the eye is to be saved.

DR. HARGITT: I had two cases of interest here tonight showing the site of the scleral operation wound, and in one, the changes which have taken place at the site of the foreign body (in the retina and choroid) as evidenced by the extensive pigmentation. This one also shows the shape and direction of my operation incision. In this case, the pathway of the foreign body was outside of the lens, so that the lens was uninjured and the vision of this eye was  $20/20$ . In the other case, the foreign body had passed thru the peripheral portion of the lens. For a while, there was a star shaped opacity in the posterior capsule or in the posterior layers, and a somewhat dense cloud in the temporal periphery of the lens. Now the center of the lens is almost entirely clear and the patient has  $20/30$  vision.

In my experience covering some twenty cases, in only one was I unable to recover the foreign body. This one was located in the extreme posterior pole, and the position was not changed by two attempts at removal with the magnet. After the needling of his traumatic cataract he had  $20/40$  vision. Of these some twenty cases, probably three quarters were foreign bodies in the vitreous; of these three quarters, six had penetrated without injuring the lens, and recovery of the foreign body thru posterior route resulted in perfect vision. None of these cases had any infection occur and the operation wounds healed very promptly. From my own experience, I must agree with Dr. Ohly, in preferring the posterior route, for extraction of foreign bodies of this type.

DR. RALPH I. LLOYD: The lesson to be learned from the egg albumen experiment is as follows: It takes about five seconds for the foreign body to reach the magnet, so it would seem wise to allow quite a little time for the magnet to work before we changed to another position or discontinued the effort.

DR. PRICE: In the removal of a foreign body, the choice of the method is determined by the size of foreign body and its site. The magnet should be used in a position which coincides with its

vertical axis for its greatest efficiency. The lines of force form a cone, the axis of which represents the line of greatest pull. If the magnet is placed at  $45^\circ$ , there will not be the proper pull.

The anterior method is useful where the incision would otherwise have to be in the region of the ciliary body. Bring the magnet over the apex of cornea. If you insert your small magnet immediately after you have opened the anterior chamber, you may entangle the iris. Wait five minutes to permit partial restoration of the anterior chamber. Good results depend upon having the least trauma by instruments and by the foreign body.

DR. GEORGE S. DIXON: The matter of not finding a foreign body when it is present recalls a patient X-rayed nine times, before the shadow of a triangular piece of metal was obtained. This was inexcusable; one attempt by the merest tyro should have been sufficient to detect the foreign body. No person is infallible; but there is small excuse for not finding a steel foreign body. I have been accused of failure in two cases. I am reasonably sure that one was negative, and in the second the foreign body reported to have been removed may have entered the eye subsequent to the first examination.

I think it is a mistake to pull a foreign body forward at right angle to the center of the cornea. I formerly believed it impossible to draw a foreign body thru the lens by means of the magnet, but I saw it done. A foreign body of about  $\frac{1}{4}$  mm. or less was in an eye which had a clear lens. After the magnet was applied the foreign body was found in the anterior chamber, and the lens showed a line thru its center streaked with blood. It is a mistake to drag a ragged foreign body thru the zonula. It is unwise to bring the eye close to the magnet for the first attempt to extract a large foreign body, say over 3 or 4 mm.

An X-ray examination should be made in all cases of eye injury. A case in point—an eye was struck by a snowball. A cataract resulted. There was no history of other injury. A cataract extraction was done, but the case ran a protracted, unsatisfactory course. An X-ray demonstrated the presence of a piece of metal at the fundus. The eye was lost.

A surgeon will frequently undertake to remove a foreign body, fail, and return the patient to the Ward; and the next day again attempt its removal by reapplying the magnet. Relocalization should be done. I believe it unwise to use the posterior route in an eye which has been exposed to the magnet without another localization.

DR. OHLY: In reference to Dr. Lloyd's question, I cannot conceive a small particle in the eye becoming polarized. It must be due to the magnet when this occurs. I am very much interested in the egg albumen experiment, but I do not know if these conditions are the same in the vitreous. I certainly agreed with Dr. Dixon. If I have attempted to extract by the anterior route, then before entering the vitreous, I always have a relocalization done.

WILLIS M. GARDNER,  
Secretary.

### THE PITTSBURGH OPHTHALMOLOGICAL SOCIETY.

MAY 14, 1923.

DR. EDWARD B. HECKEL, Presiding.

At the invitation of Dr. J. B. McMurray, the meeting was held at his office in Washington, Pa. By vote of the Society, the scientific part of the meeting was given over to Dr. McMurray for the presentation of clinical cases. After the meeting, Dr. McMurray entertained the Society at dinner at the George Washington Hotel.

#### Anterior Brain Tumor.

DR. J. B. McMURRAY presented the following: S. W., female, aged 43. Had always enjoyed good health. Was struck down by an automobile two years ago; was unconscious for a short period, but recovered and was well until six weeks prior to first visit to the office. At that time, she complained of severe neuralgic pain in right side of the face, general weakness and malaise. Examination of the eyes showed she had a congenital alternating divergent squint. Vision in each eye was  $\frac{6}{4}$ . Cornea, anterior chamber, iris, lens, media and fundus were found negative

in each eye. Repeated examination during the six weeks found fundi negative. During the last two weeks she was in the hospital, a diagnosis of anterior cerebral brain tumor was made, the diagnosis being based on the absence of focal symptoms and the development of vesical and rectal incontinence. Two days prior to death, pa-

go to the hospital, but was not admitted until November 11th, 1922, at which time the optic discs were much swollen and the fields contracted; vision reduced in right eye to 6/12 and in left eye to 6/15. The headache at that time was quite severe and relieved only by spinal puncture. Spinal fluid was under pressure and was negative

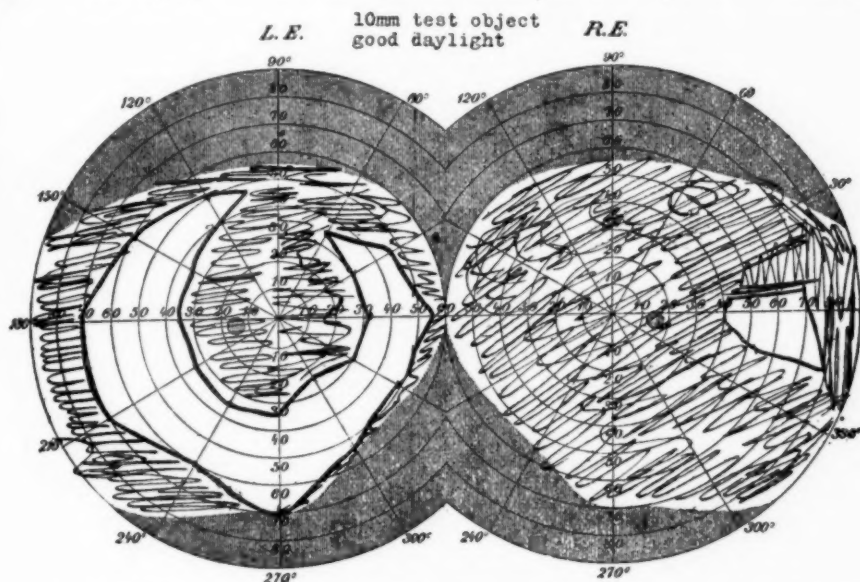


Fig. 1. Remaining fields of vision in tumor of anterior brain. Ophthalmoscopic examination negative until two days before death.

tient developed a low grade papillitis. Autopsy showed a large tumor in the anterior lobe. From a symptomatic standpoint, the eye remained negative until two days prior to death.

#### Posterior Brain Tumor.

K. T., female, aged 19. On October 7th, 1922, she came complaining of headache and blurring of print. She had some headache all summer before, but not enough pain to annoy her much. Vision at that time in the right eye was 6/6, left eye 6/4. With correction of plus 1.75 sphere, combined with plus 0.50 D.cy. ax. 90°, vision in each eye was 6/4. No fundus changes were found at that time. October 24th, 1922, she was again examined because of continued headaches. Examination showed beginning edema of the retina surrounding the discs, with blurring of edges of discs. She was advised to

to Wassermann. Cell count was normal. Swelling of the discs increased, until December 14th, 1922, when a decompression was done in the right temporal region, in the hope of postponing any further involvement of the optic nerve. The headache, vomiting and dizziness were relieved; vision has remained stationary. Six months later, patient still has enough vision to go about alone.

#### Brain Tumor.

Female, aged about 17. She came for severe headache and failing vision. In the Spring of 1921, vision became so bad that she had to discontinue school work. Had always been very hyperopic, but with correction had vision of 6/6 in each eye. In Spring of 1921, vision was reduced to 6/20 in each eye. There was no change in the discs and nothing of importance in the fields.

Headaches could not be relieved. In the winter of 1922, headaches became severe. X-ray plates of head showed cloudiness over right frontal. The frontal sinus region was opened and the sinus found absent, but following this operation, patient had relief from headache for a couple of weeks. A second operation was done to relieve what was thought might be an abscess in the frontal region. Again pain was relieved, but no abscess found. The slight lowering of pressure evidently was the cause of the relief. At no time was there any change in the disc. The patient recently has been so sick that no fields could be taken. Her vision remains poor, but does not seem to be failing. Since presenting this case, the diagnosis has been changed from brain abscess to brain tumor, probably located near the floor of the fourth ventricle, with pressure on the optic nerves near their origin, which probably accounts for the failing vision, the lack of fundus findings and the peculiar fields, a chart of which is attached. Patient has had two temporal decompressions and at the present time is free from pain, vision not improved, fundus condition apparently normal.

#### Detachment of Retina.

G. M., male, aged 19. On July 8th, 1922, patient came complaining of pain in right eye, which had begun the preceding April. On entering school, the school examiner reported he had normal vision in each eye. Patient played football during the fall and basketball during the winter. Examination showed fluid vitreous, with floating opacities and an extensive retinal detachment, well forward and extending well up on the temporal side and on the nasal side. Transillumination did not suggest neoplasm. This is evidently a case of traumatic detachment of the retina.

#### Congenital Subluxation of Lens.

Female, aged about 30. Came for headaches and nausea after close work. Has worn glasses six years; last change three years ago. Awakens with pain in the head, which usually gets better during the day. Has

nausea after reading, beginning in about ten minutes, and if she continues to read will vomit. Vision without correction is O.D., 2/60; O.S., hand movements. The right lens is dislocated outward. With correction of minus 7.00 D., vision in right eye is improved to 6/30.

#### Osteoma of Orbit.

Male, aged 32. In 1917, was struck in left eye with a hammer. Some weeks afterward noticed eye was becoming prominent. This was not accompanied with any pain, but vision was double occasionally. At that time, he had no demonstrable diplopia, or any evidence of muscular imbalance. Palpation showed a hard mass, beginning just back of the lacrimal groove and extending into the orbit. The nose revealed nothing, except it was very narrow in the upper straits. Patient was kept under observation and in Jan., 1917, was presented before the Pittsburgh Ophthalmological Society, where the suggestion was made that the mass might be a mucocele, altho on palpation it seemed too hard. In Feb., 1919, following two rather acute attacks of pain in the left frontal region, an operation was advised. A Killian incision was made and the inner wall of the orbit exposed. The frontal sinus was opened above the orbital ridge and found full of pus and mucoid secretion. An attempt was made to pass a probe into the nose, thru the nasal duct, and found impossible. An exostosis, originating in the ethmoid, of ivory hardness, and extending into the orbit, blocked the normal drainage from the frontal sinus. Drainage of the left frontal sinus was made into the right nostril and remains open to this day.

At the present time, the eye is much more prominent than it was four years ago, but the patient does not have any diplopia. The case is presented to show this interesting condition, that is, the marked proptosis, with no diplopia. The patient has persistent fistula under the left frontal. Entrance into the nose is impossible on account of the extent and hardness of the osteoma.



### Degeneration of Globe Following Contusion.

Male, aged about 15, came for blindness in right eye. Last basketball season, was hit in the right eye with a basketball. Thinks vision was effected immediately after the injury. Five weeks ago, was struck in the right eye with the palm of a fellowplayer's hand. Has had some pain for a couple of days. Examination shows redness around the cornea, anterior chamber shallow, lens entirely opaque, tension normal. Light perception not good, consensual reflex prompt, but direct very sluggish. Transillumination shows iris atrophied thruout the entire extent with the exception of a little place at the upper extremity of the 90° line. Patient has undoubtedly had, in addition to the detached retina at the time of the injury, a subsequent intraocular inflammation to account for the degenerative changes occurring later.

### Atypical Parenchymatous Keratitis.

Male, aged 7. Left eye had a spot on it. Mother noticed eye getting white over a year ago. She thinks spot disappears at times, but this is doubtful. Right eye, vision 20/20. Left eye, 20/100. Examination shows a very dense, whitish infiltrated area, center of left cornea. The infiltrated areas are not coalesced but appear in five areas rather closely placed in center of cornea. They are quite deep in the substance of the cornea. There is some new vessel formation from the corneoscleral margin. The patient has notched teeth. No Wassermann made.

GEORGE H. SHUMAN, M.D.,

SECRETARY.

## CHICAGO OPHTHALMOLOGICAL SOCIETY.

Monday, October 22, 1923.

DR. ROBERT VON DER HEYDT, Presiding.

### Gumma in Orbit.

DR. G. F. SUKER described the findings in three cases of intraorbital gumma with optic nerve involvement, and annular gumma of the conjunctiva, but the patients did not report at the meeting.

### Mucocele of Ethmoid with Proptosis of Right Eye.

DR. RICHARD L. BAUER described the above case and presented the patient. The case is published p. 218 of this Journal.

### Medullated Nerve Fibers in the Retina.

DR. CLARENCE LOEB presented a colored drawing of this condition, the work of a young artist in the Michael Reese Dispensary, Eye Clinic. (Fig. 1.)

### Congenital Ptosis Corrected by the Hunt-Tansley Operation.

DR. CLARENCE LOEB presented this case. (See p. 216).

### Synechia of the Vitreous to the Cornea.

DR. H. M. COTTLE (by invitation) read a paper on the above condition. (To be published in this journal).



Fig. 1. Case of medullated nerve fibers in the retina.

*Discussion.* DR. ROBERT VON DER HEYDT stated that Vogt has found that these adhesions nearly always follow discission. However, this may be true only if the vitreous is semifluid in nature. Aqueous and vitreous are very compatible in the anterior chamber of an aphakic eyes. With the slit lamp, it is very easy to determine the consistency of the vitreous in the presence of a fairly transparent lens. By means of our older methods, this is possible only if vitreous opacities are present, as they betray the fluidity of the vitreous by their movements.

DR. W. H. WILDER stated that Treacher Collins had preceded Meller in describing adhesions of the vitreous to the cornea. His findings were based on the examination of pathologic specimens. However, he claims that during the discission, a small tag of capsule is dragged into the corneal wound, which aids the formation of the adhesion of the vitreous, and is the real cause. Secondary glaucoma probably arises as a result of this capsulo-vitreo-corneal adhesion. Another point to be noted is the fact, that there is more danger of vitreal adhesion when the discission is made thru the center of the cornea than elsewhere.

DR. VON DER HEYDT said that the slit lamp shows that many of these strands are thin and very delicate. It is impossible to mistake them for capsule shreds. Incidentally, he wished to say that the text book definition of cataract, as including an opacity of the capsule, needs to be changed. Congenital or inflammatory deposits may be formed on it, but the capsule in itself never becomes opaque, nor is it absorbed in aphakic eyes. In a shrunken lens, partly absorbed, it is wrinkled. These wrinkles conform to the depressions between the lamellae of the cloudy lens substance, and present double, transparent, glassy lines.

DR. H. S. GRADLE said that for adhesion of the vitreous to the cornea, it is necessary that it be preceded by a rupture of the posterior capsule and the hyaloid membrane. As both of these are comparatively firm, and as a direct lesion of them during discission is infrequent, it is easy to see why adhesion of the vitreous to the cornea is a rather rare finding. He reported a case, where discission caused a lesion of the posterior capsule, followed by hernia of the vitreous, which moved back and forth synchronously with the patient's breathing, but as the hyaloid membrane was not injured, the hernia eventually receded.

DR. H. M. COTTLE (closing) said, that it was interesting to know that the pathologic findings had preceded the clinical. His attention had been drawn to this condition by the deformed pupil described in the third case.

#### **Time Reactions of the Pupil.**

DR. H. S. GRADLE described his meth-

od of investigating this subject and the instruments employed. Observations were made of the movement of the pupil by means of moving pictures, and the time periods of the different phases calculated from them. A brief latent period was followed by a primary contraction, this by a secondary contraction, which was followed by a primary and a secondary fatigue dilatation. The paper will appear in full in this Journal.

*Discussion.* DR. G. F. KEIPER, Lafayette, Ind., said that Dr. Gradle's findings would be of great importance in psychologic research, where time reactions play a great role.

#### **After Results of Strabismus Operations.**

DR. C. W. HAWLEY read a paper describing his experiences in the operations for strabismus and their after results. He had had successes and failures in all forms of operations—tenotomy, advancement and tucking—but he believed that the form of tucking operation as advocated by Dr. Woodruff was the best.

DR. H. W. WOODRUFF said that he was glad to know that Dr. Hawley had been using the tucking operation so long, and with such good results. The most extreme cases can be corrected by combining the tucking, if necessary, with a partial tenotomy. It is rare that binocular vision and fusion can be attained. One such case he had reported before this society several years ago—a case of divergent strabismus in a myope.

DR. G. F. SUKER said that binocular vision and binocular fusion are two separate and distinct coordinate functions, obtained only in eyes with normal muscle balance and equal visual acuity. Eyes with unequal vision hardly ever have binocular fusion. Five points are necessary for a perfect result—cosmetic, binocular vision, binocular fusion, stereoscopic vision and stereognostic vision. This is obtained only in cases of alternating strabismus, with equal vision in the two eyes. Any advancement operation is not mechanically scientific, while any shortening operation is. An advancement disturbs the lever principles of the muscles. Ocular muscles are levers of the first class, and a successful advancement puts that muscle

in levers of the second class. The mechanically efficient, harmonious and synchronous in their action when all muscles are of one class, an interposition of a muscle of another class will cause more or less cyclophoria. Advancement operations, in most instances if not in all, are but shortening operations, as the base of insertion is only enlarged by establishing a new insertion, as the tendon stump becomes firmly adherent to the overlying advanced muscle, and the advanced section is necessarily thruout its entirety adherent to the sclera. Advancements cause cyclophorias in nearly every case where the advancement is successful, while shortening does not. He has never succeeded in obtaining 20/20 vision in an amblyopic strabismic eye, and does not believe that it and fusion can be obtained by amblyoscopic or stereoscopic exercises.

DR. G. H. MUNDT asked at what age the essayist advised operation, and whether he made a preliminary attempt to correct the strabismus by refraction. He considered the above two points so important that they should at all times be considered before one can discuss the results of strabismus operations.

DR. C. W. HAWLEY (closing) said, that most of the discussion was not pertinent to the paper. Some of his patients had developed binocular vision and binocular fusion. He agreed that an advancement operation was not as good as a shortening one. The paper was intended only to give some singular results of strabismus operations, and to show that binocular fusion and vision were possible after them.

CLARENCE LOEB,  
Corresponding Secretary.

## COLORADO OPHTHALMOLOGICAL SOCIETY.

NOVEMBER 17, 1923.

DR. C. A. RINGLE, presiding.

### Melanosarcoma at the Limbus.

J. M. SHIELDS, Denver, presented a man, aged thirty-five years, who had come on account of a tumor at the outer margin of the right cornea. There was a history of this eye having been pecked by a chicken in the patient's childhood. The patient's atten-

tion had first been drawn to the growth when he was examined for the army in August, 1917, when the medical examiner stated that there was a small brown spot just to the temporal side of the cornea on the sclera. The tumor was now composed of two parts, each of which was sausage shaped. The upper portion measured about 4.5 by 5 mm., and covered the upper outer part of the cornea, and the lower half, which was of about the same dimensions, covered the lower outer part of the cornea. The upper edge of the growth was slightly elevated above the cornea, while the lower edge protruded about 3 mm. and rested upon the margin of the lower lid. The tumor was mottled in color and was heavily pigmented and quite vascular. A large pigmented area overlay the sclera to the temporal side of the principal tumor mass. Vision of the eye was greatly reduced.

*Discussion.* W. C. FINNOFF, Denver. This eye should be enucleated and the conjunctiva should be removed as far as the fornix. Every member of the society present was in favor of complete removal of the eyeball with the conjunctiva as far as the outer fornix.

W. A. SEDWICK, Denver, thought that removal of the conjunctiva should be done with a cautery knife.

### Simple Glaucoma.

W. C. BANE, Denver, presented a woman, aged sixty-three years, who had come in July, 1923, with the statement that after contracting a cold in the eyes the vision had become very much impaired. There had been no pain at that time. Rainbow colors around lights had been noticed, and there was limitation of the vision of the left eye to a very narrow area. With the Gradle-Schiötz tonometer the tension of the left eye was 33 mm. The left pupil was slightly larger than the right. There was slight cupping of the right and marked cupping of the left optic disc. Corrected vision was R. 5/10, L. 5/10 slowly. The fields were greatly contracted, the left extremely so. Under the use of miotics, there had been a slight further narrowing of the fields. On November 16 the tension of each eye had been 43 mm. The patient had declined operation.

**Discussion.** J. A. PATTERSON, Colorado Springs, suggested the importance in such cases of operating first on the worse eye.

G. L. STRADER, Cheyenne, Wyoming, remarked that in this type of case the result of surgical interference was sometimes disastrous, and he mentioned a case in which, after the Curran operation the eye had filled up with blood, and had never recovered vision.

#### **Choroiditis.**

W. C. BANE, Denver, presented a man, aged twenty-six years, who had first come in September, 1921, on account of blurring of vision of the right eye, which had been associated with general clouding of the vitreous. After two months treatment the vision had improved to about two-thirds of normal. The patient had returned recently with a similar condition and vision of 5/10. There was a large patch of old choroiditis in the lower nasal quadrant. Wassermann and urine examinations had proved negative.

W. H. CRISP, Denver. In spite of the fact that the Wassermann is negative, and in view of the practically negative appearance of the teeth, I believe that antiluetic treatment gives the best prospect of cure.

W. C. FINNOFF, Denver. It is well to emphasize the importance of going over the whole fundus very systematically whenever there are opacities in the vitreous. It is often necessary for this purpose to use a high power source of illumination such as the Shahan lamp.

G. F. LIBBY, Denver. And in every case of floaters in the vitreous we should be absolutely sure of the condition of the nasal sinuses.

J. A. PATTERSON, Colorado Springs. Given vitreous opacities, there is something else somewhere in the eye, altho it may be so far forward that you see it with difficulty, or not at all.

#### **Hole in Macula.**

W. C. FINNOFF, Denver, presented a man, aged nineteen years, who three years previously had been struck in the right eye with a fist. After the accident severe ecchymosis had for several days prevented the patient's

discovering that the vision was affected. Since that time there had been a blurred area in the center of the field of vision. The vision of the injured eye was 5/20 eccentric. The left eye had vision of 5/4. There was a small round hole at the center of the right macula. Its edge could be clearly distinguished, and the bottom of the hole was occupied by red choroid with a finely stippled pigmented surface. The parallax between the retinal surface and that of the choroid was clearly manifest.

#### **Retinitis Proliferans Without Hemorrhage.**

W. C. FINNOFF, Denver, presented a man, aged twenty years, whose left eye showed a remarkable series of proliferations of retinal bloodvessels and scar tissues, altho there had been no hemorrhages or exudates into the retina or vitreous. Nine months previously the right eye had become red and slightly painful. The eye had been indifferently treated for a month, and had become quiet; but the vision had remained poor. Six months later the vision of the left eye had begun to fail. At the time the patient had come to Dr. Finnoff for consultation in May, 1923, there was slight pericorneal injection of the right eye; and the lower half of the iris was bound down to the lens capsule by a thick fibrous synechia. With the corneal microscope, the iris stroma was found to be slightly hazy, and the vitreous was filled with a partially organized exudate, which only transmitted a faint fundus reflex when examined with the ophthalmoscope. The tension was 10 mm. of mercury (Schiotz). Vision was hand movements at one foot. The vision of the left eye was 1.1. The iris was normal. Several membranous floating masses were present in the anterior chamber, otherwise the media were clear. The optic nerve was slightly red. The retinal vessels were tortuous. In the extreme periphery of the fundus on the nasal, lower, and temporal sides, there were several small masses of white scar tissue in the region of the retinal vessels.



The family and past history were negative. The lungs, heart, abdomen, and teeth were normal. The urine and Wassermann reaction were negative. The tonsils were removed upon request, and no other focus of infection was found.

With the exception of the interval between June 12, and July 18, the patient had been seen regularly. There had been no hemorrhages or exudates into the retina or vitreous at any time. On May 31, two small tufts of vessels were seen on the disc at the edge of the physiologic cup. These gradually proliferated forward into the vitreous, throwing out new loops as they grew. They increased in breadth and became fan shaped. Scar tissue gradually surrounded the bloodvessels, and at the time of report the bloodvessels were almost entirely obliterated except at the apex of the mass, which was several millimeters in front of the disc. Finger like projections of bloodvessels, surrounded by a coat of fibrous tissue, had proliferated forward from the masses of scar tissue in the periphery. At the present time, the left disc could be seen, but the macular region was not affected. The vision of the right eye was unchanged, that of the left was 1.0.

*Discussion.* EDWARD JACKSON, Denver. I have never seen such a combination before. Even during the interval when the patient was not under observation, it is improbable that there could have been much of a hemorrhage without his noticing impairment of vision, and without some evidence of it being subsequently noticed. There seem to be some things that influence involvement of the vitreous which we do not know about. This looks more like a primary lesion of the vitreous than any system of vessels I have seen before.

J. A. PATTERSON, Colorado Springs. Could not this be explained on the basis of a syphilitic infection attacking the vessels and choroid?

W. H. CRISP, Denver, suggested that some cases of supposed remains of hyaloid vessels might have arisen in this way.

DR. JACKSON recalled a case seen years ago as to the cause of which there had

always been great question between hyaloid remains and pathologic disturbance in the coats of the eye.

### Hyperphoria.

D. A. STRICKLER, Denver, presented a girl, aged ten years, who since early childhood had had a habit of tilting her head toward the right shoulder with the face directed toward the right, giving the impression of some deformity in the lower cervical region. On November 5, 1923, it had been shown that, while the patient could hold her head straight, to do so gave double vision. There was a left hyperexophoria of twenty degrees when the patient looked straight ahead. With a twenty degree tilting of the head, this was reduced to ten degrees, the measurements obtained varying more or less from day to day. Both the hyperphoria and the exophoria diminished when the eyes were turned down, and increased as the eyes were turned to the right. The most extreme separation of images was when the eyes were turned up and to the right. It was at no time possible to obtain an admission of obliquity of the false image.

*Discussion.* A. C. MAGRUDER, Colorado Springs. The right eye stands higher than the left, and the left eye protrudes more than the right. Rather than using any sort of operative procedure, I believe that muscle exercises will overcome the difficulty.

W. H. CRISP, Denver, suggested that tenotomy of a vertical muscle might be worth while, but that the patient might be able to wear strong vertical prisms with advantage.

EDWARD JACKSON, Denver. As to the lack of obliquity of the image, old cases always change to some extent. The greatest effort seems to be made to compensate for any tendency toward declination of the image. The images are brought parallel, even if the organism is unable to overcome the other deviations. This condition may have started in a lesion which caused marked declination. A tenotomy of the inferior oblique may be worth considering.

E. B. SWERDFEGER, Denver. With the head vertical there was no position in which the images corresponded.

(Dr. Strickler later informed the secre-

tary that the faulty position of the head had been entirely overcome by placing a four degree prism base up before the right eye, and a four degree prism base down before the left eye.)

W. H. CRISP,  
SECRETARY.

## LEAGUE AGAINST TRACHOMA PASTEUR INSTITUTE, PARIS.

October 20th, 1923.

### Trachoma in Lorraine.

DRS. JEANDELIZE and P. BRETAGNE, Nancy, thought trachoma has become more common in Lorraine since the war, due to the influx of foreign labor (Italians, Africans, Poles). This influx of labor was brought about by the great development of the industries. Very interesting statistics are shown by the authors in the case of valleys of Briey and of Nancy. As a number of children in these areas have become infected, it is high time to take prophylactic measures. The efforts in this direction should be coordinated, and the medical public should be the first to take the matter in hand.

*Discussion.* DR. AUBARET is not surprised at the spread of trachoma with the influx of foreigners. Formerly notification of infection was obligatory in this region.

DR. MORAX said that obligatory notification would probably be introduced into France, and that explanatory instructions would be sent to all interested parties.

### Treatment of Rebellious Ulcers and Keratitis By Burial Under the Conjunctiva.

DRS. JEAN SEDAN and RENE HERMANN, Marseilles, said: for several years past this method has been employed with good results in the clinic of the Hotel Dieu in Marseilles. It is indicated in severe trachomatous keratitis with rapid spread either on the surface or into the depths; in painful keratitis with photophobia and tearing; in corneal lesions due to a secondary infection; and, lastly, in rebellious and torpid keratitis.

The technic is very simple; after a subconjunctival injection of a 2% solution of syncain-adrenalin, the conjunctiva is dissected free and loosened from its

bed; the two flaps are sewed either with interrupted or continuous suture. The latter is more lasting. Now the treatment of the conjunctival sac can be more vigorous. The stitches cut thru on the fourth day, and are removed on the fifth.

The immediate results are: rapid relief of pain, tolerance of intensive treatment, total or partial disappearance of the pannus, more rapid cicatrization of the corneal lesions; decrease of photophobia and tearing. The ulterior results are the disappearance or improvement of the severe corneal complications. Four pertinent cases were described.

*Discussion.* DR. TERSON. Covering the cornea with the conjunctiva may bring benefit, but it may also fail. In those corneal ulcers which are so severe and drag the disease out so greatly, the superior culdesac needs energetic treatment, as this is the original seat of the condition; either excision or deep cauterization of Abadie is called for. My conjunctival retractor for the superior culdesac, which fully spreads the culdesac without causing pain or changing the anatomic relations, is a great help in this, as in all other forms of treatment of trachoma. It is also useful in making an early diagnosis.

### New Researches on the Histology and Cytology of Trachoma.

DRS. AUBARET, ROUSLACROIX and HERMANN, Marseilles, reported that in these researches made on fresh trachomatous tissue and on conjunctival fragments, which had been kept in the incubator in serum taken from the individual affected with trachoma, the following interesting histologic and cytologic details were observed:

1. The character of the intraepithelial cellular elements.
2. The origin and the evolution of the different cellular components of the trachomatous follicle.

3. The structure and formation of the vessels in the center of the follicle.

They describe the presence of certain cellular forms, hitherto not described, holding the epithelial cells apart, and of certain epithelial elements which have migrated into the granulation. An early change takes place in the epithelial cells, a condition of isolation and rapid disappearance of the conjunctival epithelium.

The cells of the granulomatous follicle are more resistant, but they, also, end by degenerating. This general histolytic process of all the elements of the granulomatous conjunctiva can be plainly seen after the tissue has been four hours in the incubator, is far advanced after eighteen hours, and has reached its final stage after thirty-six hours.

These researches do not yet warrant us in drawing any conclusions as to the practical value of granuloma serum on trachoma in evolution.

#### Difficulties of Diagnosing Incipient Trachoma.

DR. V. MORAX, Paris, said one is seldom called on to make a diagnosis of incipient trachoma in a country where the disease is endemic, as it is generally brought to one's notice after it has reached a stage where a mistake is hardly possible. It is different in countries where the disease occurs with rarity.

After exhibiting a series of autochrome photographs of trachoma patients, Morax reported a series of observations made on people with follicular lesions simulating trachoma, in whom the evolution, and the absence of corneal lesions have confirmed the diagnosis of a nontrachomatous condition. He showed the analogies and differences in an affection which occurs rather frequently: follicular conjunctivitis contracted in swimming or fishing pools, by transmission from man to man. The extension of the follicles to the tarsal conjunctiva of both upper and lower lids and to the culdesac without predominance of the follicles of the upper lid, is in the beginning the only important clinical feature.

The author then presented reproductions of conjunctival syphilis of a follicular type, seen in young subjects (hereditary syphilis) and in adults. Tuberculosis of the conjunctiva of the follicular type with ulceration, is seen mostly in subjects affected with lupus of the nose, or of the lacrimal apparatus. Conjunctivitis folliculosa with large follicles might be confounded with trachoma, as the author illustrated by one interesting case. Mention was made of certain follicular conditions occurring in chronic suppurating dacryocystitis. The diagnosis of vernal conjunctivitis does not, as

a rule, present any difficulty. Under the name of atypical severe follicular conjunctivitis Morax cited two cases, the nature of which could not be well defined. The differential diagnosis from trachoma is difficult because marked corneal lesions are associated with it.

#### Trachoma in Marseilles in 1923.

DR. JEAN SEDAN, Marseilles, reported that since the war trachoma has assumed vast proportions in Marseilles. At the Hotel Dieu alone, 15 per cent of the patients were trachomatous. Emigration to South America has greatly increased. Marseilles is a favorite port of departure for Syrians, Armenians and Italians, many of whom remain in Marseilles. A camp had to be assigned for isolating trachomatous individuals; this was done at the instance of Dr. Aubaret. There are also many cases of trachoma amongst the Tunisians, Moroccans, Turks and Russians who stream into Marseilles. In the public schools there are between six and seven thousand children afflicted with trachoma, and the lyceums have not been spared. Marseilles is, therefore, a trachoma center of the first order, all the more interesting on account of the diversity of the origin of the cases. It should, therefore, be the training school for those who are to take up the fight against trachoma.

#### Fight Against Trachoma. Instruction and Propaganda by Film.

DR. AUBARET, Marseilles, thinks the greatest obstacles one encounters in the prophylaxis and treatment of trachoma is the ignorance and inertia of those who are victims of the disease. The use of films may be a great aid in overcoming these obstacles. Contrary to the difficulty of being understood when addressing a cosmopolitan audience, the film is understood in every climate and under every latitude. There are two parts to the film: in the first the nature and dangers of trachoma are depicted. Pictures are shown which demonstrate the rôle of contagion and the gravity of the lesions. The second part shows how this disease is treated and cured. As a prophylactic measure instruction by film can be given the patient with his home treatment. Thus great good can be accomplished by the film method.

Translated by M. W. F.

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## PHOTOTHERAPY.

Light and the closely related radiations of infrared and ultraviolet, have the most intimate relations with essential vital processes. All living matter is more or less sensitive to them. An optimum of heat is a primary condition of the best nutrition and growth of every living organism.

The mechanism by which the higher animals are protected against the invasion of ultraviolet radiations indicates clearly, that they can be highly dangerous to important processes in the body. Especially are the central portions of the nervous system so protected. But like other influences capable of interfering with vital processes, as the powerful poisons, they probably are equally capable of usefulness in controlling disease.

The prefix photo—meaning light—has come to be used in words referring to invisible radiations closely allied to light, so that phototherapy seems the best word to use for this whole branch of therapeutics.

Heliotherapy (from helios, the sun) might be thought a better term, since from the sun come all the different radiations with which we are acquainted. But its

meaning may well include effects of radiation far removed from those of light, as electricity, magnetism, radium, etc.; and the most exact applications of light therapy have been made, not with sunlight, but with radiations obtained from the carbon arc lamp, of fifty amperes and fifty volts, devised by Finsen.

Lundsgaard, at the Oxford Congress last year, reported on this form of light treatment for conjunctival diseases. He has worked with it, in the Finsen Medical Light Institute of Copenhagen, for twenty years. Finsen believed that the visible rays had a share in the therapeutic influence, but also that the ultraviolet rays were essential.

The radiations are concentrated on the lesions to be treated, by quartz lenses, which permit the passage of ultraviolet, as glass lenses do not. This concentration would produce a temperature of several hundred degrees centigrade, if the heat were not filtered out by a quartz cell, thru which a stream of water is kept flowing, while the cell is pressed against the part to be treated.

In this way, without damage to sound tissue, the destructive effect of the ultraviolet on pathologic cells and bacteria is obtained, as well as arterial hyperemia



to increase metabolism. The method was first used about the eye for lupus, and then for other forms of tuberculosis of the conjunctiva. For making applications to the conjunctiva, Lundsgaard describes a prism, having angles of 30, 60 and 90 degrees respectively. The hypotenuse side, opposite the 90 degree angle, is one side of a closed metal chamber containing dry air. It is placed against the eyeball, and reflects the light to the second side, opposite the 60 degree angle; which is in contact with the diseased tissue on the inner surface of the lid. The shortest side, opposite the 30 degree angle, receives the light thru a chamber containing the flowing water to keep down the heat.

For lupus and primary conjunctival tuberculosis, phototherapy gives ideal results. Lundsgaard has treated more than fifty cases, curing every case without impairment of function of the eye, and with practically no distortion of the lids. "The duration of the sitting is not more than 10-15 minutes, the treatment causes no pain, and the reactions accompanying it—swelling of the eyelids, formation of pseudomembranes on the conjunctiva, subconjunctival hemorrhages, etc.—do not cause much trouble." At most only a few sittings are needed, and in many cases one will suffice.

Lundsgaard's investigations with regard to trachoma and follicular conjunctivitis "showed that granules can be brought to vanish totally by means of one single sitting of short duration." But trachoma is rare in Denmark. In other countries more has been done to test this method of treatment; but additional study and experience is needed before the value of phototherapy for trachoma can be correctly estimated.

A very different form of phototherapy has been developed in the "light baths." These have been applied for the treatment of tuberculosis of the bones and joints by Rollier, at Leysin, Switzerland. This is about four thousand feet above sea level, where the proportion of ultraviolet radiation is greater than at lower altitudes. Beginning with short exposures the time is cautiously lengthened to several hours a day. Under this treatment the skin becomes more active and

pigmented, the patients gain in weight and preserve or increase the size and power of the muscular system, even with little or no exercise.

Such light baths, rather than local applications of the Finsen light, are recommended by Lundsgaard for tuberculosis of the cornea, iris or deeper parts of the eye. He has used them with, and apart from tuberculin treatment, and has "come to the conclusion that light baths constituted the most effective method." As a part of the general treatment of tuberculosis, they are especially serviceable for the ocular lesions. Probably in other conditions this kind of phototherapy will be of value; but for tuberculosis its beneficial effects are now so well established that it should not be omitted.

E. J.

#### FIXATION OF EYE SPECIMENS.

Much of the material that is received by the eye pathologist has been ruined by improper fixation. It is not uncommon for eyes to be sent to the laboratory wrapped in moist gauze, or sent in bottles that contain distilled water or salt solution. Many interesting specimens that would be of scientific value are lost in consequence of this. The necessity of careful and immediate fixation of this type of pathologic material can not be overemphasized.

The peculiar physical components of the eye make it one of the most difficult organs in the body to prepare for sectioning and microscopic study. The ordinary methods of rapid fixation, or freezing, that are employed by the general pathologist, are totally inadequate for this purpose. The tough sclera and cornea form a barrier for the entrance of fixing fluids, and the highly specialized nervous tissue in the retina undergoes rapid disintegration and shows post-mortem changes, unless the eye is placed in the right kind of fixing solution immediately after enucleation. One should not open the globe before fixation is complete because of the danger of retinal detachment.

Eye pathologists differ in their preference of routine fixatives. Some prefer Zenker's solution; others use 10%

formalin, formalin-alcohol or Müller's fluid. All agree, however, on the importance of dropping the eye or the tissue, into the fixative promptly after its removal. There is no universal fixative for eye tissues, and under some circumstances, special solutions must be used to prepare the material for staining methods, that are specific for certain cells or pathologic products.

Formalin is the most convenient because every modern operating room has a bottle of formaldehyde solution in its armamentarium. Formalin is best in a 10% solution. This is made up by adding one (1) part of formalin (40% formaldehyde gas in water) to nine (9) parts of water. The quantity should be liberal; at least 4 ounces of the solution should be used for an eye. Eyes may be kept in good condition for many years in this solution, but it is better to have them sectioned as soon as possible after their removal. No further preparation is necessary and specimens may be sent directly to the eye pathologist in the fixative.

An equally good fixative is formalin-alcohol. It is prepared as follows: Add one (1) part of formalin (40% formaldehyde gas in water) to two and one half (2.5) parts of 95% alcohol and six and one half (6.5) parts of water. Specimens are not injured by remaining in this fluid for long periods of time, and may be sent directly to the pathologist without changing.

Zenker's solution has many enthusiastic advocates. Specimens fixed in this fluid give better cell details after staining, than those fixed in formalin or formalin-alcohol. It has a great advantage over formalin in preserving the true relations of the choroid. Often when formaldehyde is used, the choroid becomes so shrunken that its details can not be studied satisfactorily. Zenker's solution contains: potassium bichromat 2.5 grams., corrosive sublimat 5 to 8 grms., water 100 c. c.; just before use, 5 c. c. of glacial acetic acid should be added to the mixture. The first three components are fairly stable, and a stock solution of it can be made up and the acid added at the time that the solution

is to be used. The specimen should remain in the solution for 24 hours and then must be washed in running water for the same period of time. The washing is very important, and the specimen must never be sent in the original solution to the pathologist, if he is in a distant city. After washing in water for 24 hours, the specimen should be placed in 80% ethyl alcohol and then mailed.

Müller's fluid is an excellent fixative, but is slow. An eye should remain in it from six to eight weeks before transferring to the dehydrating fluids. Sections fixed in this fluid have staining properties that are quite similar to those fixed in Zenker's fluid. Its proportions are as follows. Bichromat of potassium 2 to 2.5 grams; sulphat of sodium 1 gram and water 100 c. c.

For the study of medullated nerve fibers, and degenerative changes in the optic nerve, specimens must be fixed in 10% formalin solution and should not be transferred to alcohol until specially treated.

For the study of sympathetic ophthalmia and other diseases of the uveal tract, Zenker's, or Müller's should be the fixatives of choice. Retinal structures and tumor cells stain more satisfactorily after treating with Zenker's or Müller's fluid than after formalin.

For fatty degeneration, osmic acid or one of the allied fixatives should be used.

The common practice of freezing an eyeball in brine before sectioning it, is objectionable; because the expansion of freezing frequently distorts relations.

The difference in resistance between the fibrous cornea and sclera, the vascular uvea and the gelatinous retina, make it impossible to obtain uniformly satisfactory sections with the freezing microtome. Paraffin embedding is equally unsatisfactory. There is no short cut to satisfactory eye pathology. The arduous and slow method of celloidin embedding is the only reliable method.

Next to improper fixation, the general pathologist is responsible for the loss of good pathologic eye material. It requires a specially trained pathologist to interpret the significance of changes in a so highly specialized organ.

W. C. F.

### TRANSPLANTING AN EYE.

The transplantation of eyes and "glands" has been so glibly discussed by operators and newspaper reporters, that those who know the enormous difficulties of preserving the life of the higher tissues under altered conditions, are justified in an attitude of skepticism. Yet even here scepticism may be a bar to learning and progress.

The reports of Koppanyi and Kolmer, to the Vienna meeting of the German Ophthalmological Congress in 1921, on the results of laboratory experiments and histologic study on rats, was met rather with ridicule than scientific interest. The narrowness of specialism was illustrated in the failure to understand the real significance of the statements made.

Prof. Przibram, seeking to secure wider publication for the results of the experiments made in the Vienna Institute for Biologic Research, sent a paper to Harrison F. Lewis, of Ottawa, the Editor of the *CANADIAN FIELD NATURALIST*. Thru his courtesy and the co-operation of Dr. Casey A. Wood, the paper was forwarded to this Journal (see p. 179), with the suggestion that it would be of more interest to the readers of the *AMERICAN JOURNAL OF OPHTHALMOLOGY* than to readers of the *Canadian Field Naturalist*.

It brings out clearly what has been done in laboratory work, in the line of transplanting the eyes of lower animals in very early life; and the evidence that in the few most successful cases there was restoration of function in the transplanted eyes, in vertebrates and even in mammals. These evidences included return of corneal and pupillary reflexes, evidences of vision by reactions to sight; and the histologic evidence, preserved structure in the retina and restoration of optic nerve fibers.

Of course, between this and restoring useful vision to a blind man, there is a great gap, that cannot possibly be passed until surgery has made greater advances than those it has made in the last century. But because the gain is not what ignorant reporters try to picture it, there is no reason to disregard or neglect what has been learned in this direction. Such

experiments can teach us much about operative technic, and the influences that preserve structure and restore function in ocular affections. E. J.

### CORRESPONDENCE.

#### Width of Lines on Astigmatic Charts.

To the Editor:

The device of Dr. Jonas S. Friedenwald to increase the contrast between the clear lines and the blurred lines of astigmatic charts, in order to make it easier to detect and measure low degrees of astigmatism, is a truly brilliant and entirely new application of the underlying principles involved. It is most refreshing to find a young American trained ophthalmologist who shows so keen an insight into this important but neglected branch of physiologic optics.

Unfortunately his application of the idea as described and illustrated in the Journal, January 1924, is sure to lead astray many who have not a solid basis of experience and of theory.

The illustrations (figs. 8 & 9), in which the astigmatism is much more evident on the Friedenwald charts than on the Lancaster charts, lead the cursory observer to conclude that the Lancaster charts are much inferior, and in particular that the radiating lines would be better if not so wide.

The illustrations, to represent actual clinical use of the charts, should have been based on photographs in which not only a cylinder lens, but also a spherical fogging lens was added to the camera lens after it was focussed sharply on the plate. Such illustrations will be found in the paper on Astigmatic Charts which I read before the American Academy of Ophthalmology and Oto-Laryngology in 1915. (See *Trans*, pp. 167-180).

Figure 2 of that paper shows four charts, with lines of differing widths. Legend under Fig. 2 reads:

"Fogged with a +0.50 sph. Cyl. also +0.50. If it were not fogged the chart with the narrowest lines would show the astigmatism most evidently; as it is, the lower right hand chart is better. In the lower left the lines are as wide as 6/6 letters, in the lower right wide as 6/12 letters, the best size on the average. For

a patient with higher astigmatism and poor vision, the upper right chart with lines equal 6/20 would be better."

Under Figure 3 the legend ends with the following: "(Note that the narrow lines on the dials become almost invisible when there is a little fogging, while the wider lines are more easily seen.)"

The following extract from this paper shows that the matter of the proper width of lines was carefully considered, and shows on what grounds the final choice was made.

"What is the best width for the lines? Some writers say they should subtend a visual angle of 1 minute, others that they may be larger. The great majority recommend 1 minute. Briefly the facts on which to decide the matter are these: When the accommodation is in abeyance and one meridian and one only is in sharp focus the narrower the line the sharper the contrast; for, while the best line stands out clear and black under these conditions, the others are very easily blurred because they are so narrow and the lines at right angles may be absolutely invisible. For use at 6 m., lines then may be as small as the letters not only of the 6/6 line but even of the 6/5 or 6/4 line, and yet give a very sharp and easily seen axis (Fig. 3). When the vision is fogged, that is, when not even the best meridian is in clear focus while the others are still more out of focus, such a chart is much inferior to one with wider lines. This is because a narrow line is so easily blurred that fogging throws the whole chart, including the clearest meridian, hopelessly out of focus, and as a result no line is selected by the patient as clear. Now, as we shall see, the patient should practically always, when the test is applied, be wearing a glass which does produce this blurring or fogging in even the best meridian. Therefore the narrow lines are inferior to wider ones. How wide? I have been in the habit of teaching that the lines should have about the width of the letters of the line to which the patient is fogged. Starting with a lens at least 2 D. stronger plus than our estimate of what he would select for best vision, we gradually reduce this strength till, supposing his vision to be normal, he is able to

read 6/10 or 6/12. On this basis the lines of the astigmatic chart should subtend about double the 1-minute angle. As a matter of fact, I determined this optimum width empirically years ago before attempting to explain it. I found that I got clinically decidedly better results with lines about that size or a little larger. Then I made this explanation of the reason. Lastly, I have photographed charts of various sizes under various conditions which seem to me to confirm the clinical and theoretic conclusions (Fig. 2). When vision is defective one may use to advantage lines as wide as 3 minutes."

"To recapitulate: The best astigmatic chart for determining the axis is one with lines about the size of the letters of the 6/12 line, about 20 cm. long, radiating at 10° intervals, the lines the blackest black and the card the whitest white obtainable. (While a complete circle is not essential, I think it is better.) The best chart to determine the amount of astigmatism is a cross which can be rotated to any axis, the cross consisting of two lines at right angles to each other about the width of the 6/10 line."

Those who habitually use astigmatic charts with success, know that the most important single factor of that success, outweighing all others, is the proper maintenance of a suitable amount of "fogging" during the test. When anything goes wrong with the test, when the patient gives inconsistent, bewildering answers (if the patient is reasonably intelligent, with a reasonably sound eye), the trouble in nearly all cases will be found to be failure to maintain the proper amount of blur by a suitable convex sphere, not too strong and not too weak.

In my writings on the subject I have suggested as a suitable degree of blur with which to begin a test, a reduction of vision to 6/10 or 6/12. This of course is merely an average. Some require more, some less. A chart, however, has to be designed for average cases to be of most general value.

Now what will happen when a patient, suitably fogged, looks at the Friedenwald chart? All lines that are fogged as much as 1/4 diopter will be virtually invisible.



The patient will be unable to select any lines as sharper, because all, including the clearest meridian, are hopelessly blurred. It becomes necessary to reduce the fogging until at least some of the lines are clear enough to be seen. When this is done carefully, a point will be reached where the less strongly refracting meridian will be nearly in focus, and the corresponding lines of the chart will become visible. The margin of error is very narrow, however, and so the opportunity for the accommodation to act is increased. The demand on the intelligent and keen cooperation of the patient is greater.

It seems probable that with black lines 5 mm. wide, bordered with white 2.5 mm. wide on each side, and with a background of neutral gray, the Friedenwald charts would be superior to the Lancaster form of the Green charts. With lines as narrow as 2.3 mm. the Friedenwald charts will be found inferior for average cases.

Those who are interested in the problem of the photography of charts reproducing quantitatively the conditions in the eye, will find in the article in the *Transactions of the American Academy* above referred to a more simple geometric solution than the algebraic solution given by Friedenwald, which is marred by some minor errors.

Boston, Mass. WALTER B. LANCASTER.

(The editor joins in Dr. Lancaster's appreciation of the idea put forward by Dr. Friedenwald for astigmatic charts—a white border on the black lines and a general gray background. When the white and black are properly mixed by diffusion, the lines of the chart become very faint, or invisible. Dr. Lancaster has also pointed out the reason for the broader black lines. Where the chart is used as an approximate test, as it usually has been, to ascertain if astigmatism is present and its principal meridians, the broader lines are more serviceable.

However, if the chart is used as a final test, to fix exactly the meridians when there remains some uncertainty as to their direction, as Dr. Crisp has used it with the cross cylinder (see A. J. O. 1923, v. 6, p. 209) the suggestions of Dr. Friedenwald are especially valuable. When it comes to the final choice of a

correcting lens, the question arises in every case, is there a little astigmatism still remaining uncorrected and what is its direction? It would look as if at least two charts were needed to get all the advantages of the radiating lines test for astigmatism—one with the broad lines chosen by Dr. Lancaster and one with the narrow or dot lines with white border suggested by Dr. Friedenwald.)

#### German Physicians in Occupied Districts.

*To the Editor:* I learn from a notice in your paper (v. 6, no. 10) (under the headline "International Ophthalmology") that the Société d'Ophtalmologie de Paris, the Société Française d'Ophtalmologie and the Société Belge d'Ophtalmologie recently published the statement that "the Society of German Medical Practitioners had decided to refuse any kind of medical assistance to Frenchmen and Belgians."

I can assure you that I know nothing of any such resolution, just as little as do any of the other doctors in Berlin with whom I discussed the matter. As a Society of German Medical Practitioners is not in existence, and wishing to ascertain the truth, I sent a circular letter to the most prominent ophthalmologists and physicians in charge of hospitals in the Rhineland and in Westphalia, that is to say of the whole territory under French and Belgian occupation. The result of this inquiry can be summarized as follows:

It is correct that immediately following the invasion of the Ruhr district by French and Belgians, at a time when the population of these districts spontaneously opposed the armed invasion with passive resistance, it was decided in some of the places to refuse medical treatment to French and Belgians. However, without exception, this happened in places situated in the Ruhr district, in a territory which French and Belgians had occupied under force of arms in January 1923. These resolutions vary in their form, but I wish to point out that even the most far reaching resolution explicitly states that medical assistance should be rendered in urgent cases. All that is stipulated is that this assistance should be given free

of charge. This lends to these resolutions a purely demonstrative character, because the French and Belgians residing in the newly occupied district were practically all persons of military rank or officials who commanded for their further treatment the French and Belgians military doctors and the army medical corps to the fullest of their need.

The meaning of these resolutions was therefore solely the following: Whenever a Frenchman or Belgian asked for a German doctor's assistance, the doctor had to examine him. In case he diagnosed that there was no immediate danger, he had to pass him on to the French and Belgian military doctors. In cases of immediate treatment being necessary, the German doctor had to give it, leaving the continuation of the treatment to French and Belgian doctors. In no case was he allowed to accept payment from a Frenchman or Belgian.

The reports before me do not mention a single case during the period of the occupation where the attitude of German medical men had led to difficulties. In fact, there are numerous cases, where German doctors had continued the treatment of members of the armies in occupation by special request of their families. They only unconditionally refused the acceptance of a fee. If such was enforced upon them—say by depositing the money in the hall—the amount was handed over to a national relief fund. This was according to my very careful investigations of the state of affairs in the newly occupied district. In the *originally* occupied district—I wish once more to draw attention to this fact—such decisions were not taken at all.

I may add as a further explanation, that should a case have really occurred and escaped my knowledge of some not quite unimportant Medical Society having taken a decision similar to that asserted by the French and Belgian Ophthalmological Societies, this is without any real importance, because, first, nobody heard about it, and, secondly, because very few Frenchmen or Belgians stayed in Germany after the invasion of the Ruhr district had begun.

To understand the attitude of the Westphalian doctors it is necessary to be

acquainted with the nature of passive resistance. The whole population, driven by a spontaneous movement, refused to render any services to the members of the enemy armies, for instance, no inn-keeper was allowed to sell food or drinks to a Frenchman or a Belgian, such action making him of course liable to very severe punishment and exposing him to ill treatment on the part of the occupying forces. The situation being what it was, the medical practitioners were of the opinion that they ought not to take a course which differed from that of their compatriots. They however—as is shown by my argument—refused from the outset to violate the commands of humanity. Wherever their medical assistance was really necessary, they rendered it. That the sole meaning of the above mentioned decisions was the desire not to separate themselves entirely from the action of passive resistance, carried on by their compatriots, is quite evident from the fact that these measures obtained only in the newly occupied district, the home of passive resistance. It is only the personal and business contact with members of the enemy armies, which they declined together with their compatriots.

I should be very much obliged to you, dear Sir, if you will find some space in your journal for these explanations.

Faithfully yours,  
Berlin, Germany. E. KRÜCKMANN.

#### BOOK NOTICES.

**Transactions of the Ophthalmological Society of the United Kingdom.**  
Vol. XLIII, 1923. Cloth, 774 pages, 18 plates, 105 illustrations in the text.

This is the largest volume of its annual proceedings that this society has published; and it contains many more colored plates (15) than have appeared in recent volumes of the series. The Presidential Address by A. Maitland Ramsay occupies eleven pages, with a statement of "the debt which general medicine owes to ophthalmology". Then ninety-eight pages and a majority of the colored plates are given to the Bowman Lecture, by George E.

de Schweinitz, taking up ocular aspects of pituitary body disorders. There are also eighteen illustrations, mostly of fields of vision.

A discussion on disorders of the blood and their ophthalmologic manifestations, with three opening papers, occupies fifty-nine pages. One on the diagnostic significance of proptosis is given fifty-four pages. The intracapsular extraction of cataract has forty-one pages. Individual papers and discussions to the extent of one hundred and forty-seven pages complete the proceedings of the meeting of the Ophthalmological Society itself. The last of these papers on "Microscopy of the Living Eye" by Basil Graves will be welcomed by those who are now trying to master this important method of examination.

The reports of the Oxford Ophthalmological Congress claim two hundred and ten pages. These include a discussion on the relationship of dental sepsis to diseases of the eye, fifty-eight pages; and the Doyne Memorial Lecture by H. M. Traquair, on the differential characters of scotomata and their interpretation, fifty-three pages. Papers from the Midland Ophthalmological Society fill sixteen pages; those of the North of England Society, thirty-three pages; those of the Irish Ophthalmological Society, fifteen pages; and one paper is included from the Ophthalmological Society of Egypt.

The long symposiums and arranged discussions lessen the proportion of short, practical and clinical communications that formerly characterized these transactions. But from the affiliated societies come many such contributions, so that, perhaps, the aggregate of such papers is not diminished. However, the plan of grouping together all the contributions of one society prevents the old arrangement of papers according to the general class of diseases that they dealt with, making it not so easy to look up all that had been included on closely allied topics.

On the whole the Society is to be congratulated on evidences of returning vigor and new development; and ophthalmologists thruout the world

have one more helpful volume that contains the latest information and suggestions on certain topics.

E. J.

**Transactions of the Pacific Coast Ophthalmological Society.** Eleventh Annual Meeting, Los Angeles, 1923. Paper, 108 pages, 12 plates and other illustrations.

Of this volume just half deals with ophthalmology. The eight papers it includes are all bright, up-to-date, well written and of interest to workers in this field. Almost all of them were actively discussed, and the discussions are appended in condensed form. The society in its short life has grown to a membership of two hundred and twenty active, with sixteen Honorary Members. It is evident that these colleagues of the Pacific Coast are interested, intelligent observers of their cases; and they are beginning to take time to record their observations and impressions. No ophthalmic library can be considered complete without this record of their activities.

E. J.

**Section on Ophthalmology, American Medical Association, Transactions, 1923.** Cloth, 416 pages, 30 plates, 7 in colors and 63 illustrations in the text, Chicago, A. M. A. Press.

This volume represents the work of but three sessions of the Section. Only the printing of a pre-session volume makes possible the consideration of such a mass of scientific material in such a short time. There are twenty-one papers, five short communications and reports from five committees, beside the minutes and lists of members and former officers of the Section.

The outstanding long papers are on the "The Lens as Seen with the Gullstrand Slit Lamp and Corneal Microscope" by A. J. Bedell; "Ocular Phenomena produced by Intracranial Lesions Involving Optic Tracts near the Chiasm" by Walter I. Lillie; "Antidiphtheritic Serum in Ocular Infection" by Ben Witt Key; and "Posterior Sclerotomy with Permanent Drain for Retinal Detachment" by Meyer Wiener. Two papers

on ocular parasites, the larvae of the sheep-bot and filaria loa, by Dr. H. H. Stark and Dr. J. W. Kimberlin respectively are also notable. There are also two on glaucoma operations, two on cataract extraction, and one each on the active agent (bacteria) in milk injections, control of hyperesthesia of the ciliary muscle thru the sphenopalatine ganglion and on treatment of methyl alcohol blindness, that have much clinical interest and value.

The preparation of such a volume entails labor and expense; but it is well worth doing. We do not know what its circulation is; but we do know that there are many ophthalmologists who could with profit add this one to their course of reading, and to their libraries for future reference.

E. J.

**Eye, Ear, Nose and Throat, Practical Medicine Series.** The Eye, Casey A. Wood, M.D., D.C.L. and Charles P. Small, M.D. The Ear, Albert H. Andrews, M.D. The Nose and Throat, George E. Shambaugh, M.D. Series 1923, cloth, 462 pages, 25 plates, 4 in color and 30 illustrations in the text. Chicago, The Year Book Publishers.

Of this volume just half is devoted to the eye. In this amount of text, about equal to two numbers of this Journal, it is not possible to take up all the current literature of ophthalmology. But the selections made from it are generally chosen with good judgment to meet the needs of both general practitioners and specialists. The work is very well illustrated. Of the plates twenty-four refer to the eye, as do twenty-two of the cuts in the text. The half tone plates from one to six illustrations each explain in least space and most clearly the conditions, instruments and methods to which they refer.

As the editors point out in their introduction: "Not many new operations have been devised, but modifications and improved technique have been suggested in a number of old ones."

The work of sifting the literature of ophthalmology and arranging it so

that it will be more directly and generally available is a great work and as good work in this direction as has been done by the editors of this book is worthy of praise and support.

E. J.

**Diseases of the Choroid, Retina, etc., at the Government Ophthalmic Hospital, Madras, during 1919-1922.** Paper, quarto, 67 pages. Madras, Government Press.

In form this is a pamphlet like the Reports emanating from the same hospital. On the first page are explained the twenty-five abbreviations used in the case reports; and the other pages are all occupied by reports of cases arranged in a gigantic table. There are 434 cases so reported. The wealth of observations presented in this condensed form makes it a great mine to be dug into, for material for the discussion of many forms of disease and questions in pathology.

One must not suppose that in such a table important details are omitted. The account of each case extends across two of these large pages, nineteen different columns. The columns devoted to age, sex, duration of symptoms, existence or absence of consanguinity, or pyorrhea, Wassermann reaction, and blood pressure are narrow. But there are broader ones for cerebral symptoms, nasopharyngeal symptoms, general disease, clinical signs of syphilis or gonorrhea, urine, blood, remarks and especially ophthalmoscopic appearances. In this last column the notes on a single case would sometimes occupy more than a quarter page of this journal. When one considers that all these notes are recorded with the help of the abbreviations above referred to, it is realized what an enormous amount of clinical information is condensed in these tables.

At first thought it will be regretted that this material could not be arranged under various headings, to make the data easy to consult with regard to any particular class of cases. But careful consideration shows how nearly impossible this would be. The thoro student, who will go over the



whole series of cases and index them for his own purposes, will be richly repaid for the time expended. It is to be regretted that this report is printed "for official use only". It ought to be available in every library of ophthalmic publications. One cannot avoid contrasting this condensed, practical information with the verbose, tedious reports of clinical cases, or detailed protocols of experiments, that are too often used to give bulk to papers which yield to laborious study only a metaphysical argument for a special theory, or the negative result that nothing can be expected from investigation along such lines.

Since the number of copies and their circulation are restricted, it is to be hoped that each will be so placed as to become available to many readers and students.

E. J.

**Notes sur la Myopia**, by **S. Druault-Toufesco**. Paper, 118 pages, 18 illustrations. Reprinted from *Annales d'Oculistique*, Paris, 1922.

This is called a clinical study, and is based on 1714 cases observed. But it also draws largely on the literature of myopia to illustrate and enforce its deductions, and each section ends with a long list of papers and books consulted, amounting in the aggregate to several hundred references. Nevertheless, it follows pretty closely the announced purpose, avoiding preconceived notions and seeking the clinical facts.

Following a brief introduction, the work is divided into sections, the subjects of which give a good idea of the many aspects from which this important subject has been considered. These are: I Age, Sex, Growth of Myopia. II Anisometropia, Astigmatism, Anisastigma. III Pupillary Width, Strabismus, Insufficiency of Fusion. IV Size of Cornea, Size of Globe, Color of Iris. V Choroidal Lesions, Cataract. VI Detachment of Retina, Glaucoma. VII Deformities of the Cornea, Congenital or Acquired, Corneal Scars, Hereditary Syphilis. VIII Congenital Anomalies. IX Physical and Psychic Types of Myopes. X Heredity of Myopia.

The above catalogue of conditions often related to myopia is extended but not exhaustive. Practical conditions connected with its causation, prevention, increase and hygiene are not mentioned; as near work, lighting, position of the head, general health, etc. The particular questions taken up, however, are well worked out, and emphasized by particular cases.

The illustrations are chiefly graphs showing the frequency of different ages and with different degrees of myopia. There are, however, some reproduced photographs of patients and diagrams of cranial types associated with myopia and the workings of heredity. In typography the pamphlet resembles the journal from which it is reprinted.

E. J.

## ABSTRACT DEPARTMENT

Reprints and journal articles to be abstracted should be sent to Dr. Lawrence T. Post, 520 Metropolitan Building, St. Louis, Mo. Only important papers will be used in this department, others of interest will be noticed in the *Ophthalmic Year Book*.

**Knüsel, Otto.** **Diagnosis of Small Intraocular Foreign Bodies.** *Schweiz. med. Woch.*, Sept. 27, 1923, p. 909.

A patient wounded his right eye while firing his gun and supposed a part of the charge had escaped backwards. V. O. D. = 0.1. Blepharospasm, epiphora, and hyperemia. A black angular foreign body was located a little paracentrally, below and out, in the cornea, surrounded by a circular

grayish zone. Two point like small infiltrations were seen at 1 o'clock and 5 o'clock in the corneal periphery. Pupil active. Lens, vitreous and fundus without changes.

It was found with the slit lamp that a sliver had penetrated from the nasal side and remained in the superficial parenchyma; it had the shape of a rectangle; 1 by 0.5 mm. In the deepest layers was a lattice like opacity. Important particulars were detected with

the slit lamp on observation of the two small infiltrations, which were not noticed with ordinary lateral illumination and loupe. The opacity at 1 o'clock went thru the entire cornea as a straight brownish line; the lower one at 5 o'clock was a grayish line, which also reached the endothelium. Slightly laterally to this line a round, gray nodule lay on the gray-brownish iris, only detectable by oscillating the lamp arm. Knowing the place it could not be found with Hartnack's loupe and intense illumination. A sliver was suspected in this nodule. Left eye normal.

The central sliver was easily removed and found to be copper. Two X-ray pictures were taken in the way that Vogt has described. (O.Y.B. v. 18, p. 9.) Both films showed an extremely fine sliver that had the same length in both pictures. It stood rather perpendicular to the iris plane. After eserine myosis, the anterior chamber was opened peripherally below and a bridge coloboma made at the place of the iris nodule. Five days later the eye could be examined with the slit lamp and a needle like brownish sliver was detected in the upper perforation at 1 o'clock, with its point in the anterior chamber. Under control of the corneal microscope it was removed with the spud, without loss of aqueous. It was 0.6 by 0.1 mm. long and consisted of iron. After renewed inspection of the films, a small well circumscribed clear spot was found in the upper circumference of the cornea and below the upper lid, which corresponded in location with this sliver. The patient was discharged with a quiet eye and  $V = 1$ .

From the medical side it is interesting, that the eye was wounded by different slivers of different metals; and the case demonstrates that small corneal perforations can only be detected with the slit lamp, and that such a small one (0.4 by 0.15 mm.) in the iris and one still smaller in the cornea (0.6 by 0.1 mm.) can be demonstrated by Vogt's skeleton free radiography. "Who does not master these finer methods, jeopardizes thru his imperfect diagnosis not only the damaged

eye, but also the other one on account of danger of sympathetic ophthalmia".  
E. E. B.

**Herbert, H. Pectinate Ligament in Relation to Chronic Glaucoma.** Brit. J. Ophth. v. 7, Oct. 1923, p. 169.

The author obtained an eye in so early a stage of chronic simple glaucoma that a rare opportunity was afforded of looking for predisposing anatomic causes of the disease, uninfluenced by secondary effects of high tension. Sections thru the ciliary region showed, among several deviations from the normal, a well defined thick tendon of the longitudinal, or meridional portion of the ciliary muscle. The fibers of this tendon passed on without interruption into the slightly looser lamellae of the pectinate ligament.

All the inner, more movable portion of the ciliary muscle was thus placed at a mechanical disadvantage with respect to any inward pull that it might exert upon the lamellae of the pectinate ligament, and thru them, on Schlemm's canal, when the muscle contracted inward. The mechanical disadvantage consisted (1) in the slenderness of the connecting band and of the trabeculae directly continuous with it; (2) in the intrusion in the ligament of the broad middle section of lamellae, derived from the meridional tendon, separating widely the innermost trabeculae from the outer purely scleral lamellae, which extended forward from the scleral spur; and (3) in the relatively great distance of the muscle, as a whole, behind Schlemm's canal.

Contrasted with this is the finding in two other specimens from practically normal eyes. The development and placing of the muscle fibers is such that they can exert much more traction on the scleral trabeculae and on Schlemm's canal. The horizontal fibers, while well developed, are excluded from participation.

Upon examining carefully available old pathologic material, a very definite relationship was observed between primary glaucoma and the particular type of ligamentous connections found in the present specimen. The contri-

bution contains four photomicrographs and two diagrams illustrating the muscular mechanism in the region of Schlemm's canal.

D. F. H.

**Fromaget, Camille.** Treatment of Attacks of Acute Glaucoma by Retrobulbar Injections of Novocain-Adrenalin. *Ann. d'Ocul.*, 1923, v. 160, p. 438-445.

The author reports three cases of acute glaucoma in which the pain was entirely relieved by one or two retrobulbar injections of a novocain-adrenalin solution. He emphasizes the necessity of injecting at least 3 or 4 cubic centimeters of the solution. Two to four per cent of novocain solution to which has been added two drops of a 1 to 1000 adrenalin solution for each cubic centimeter of the novocain solution, is advocated.

Fall in tension begins about three minutes after the injection of this solution. In one case tension fell in ten minutes to 5 (Schiotz), where it remained for another ten minutes. It gradually rose after a number of hours to its original state. The pain, however, was relieved for six days. It returned at this time but was dispelled by a second injection for as long as the patient was under observation (six months). This was a case of acute glaucoma in a diabetic, 68 years old, with bilateral cataract. Previous to the retrobulbar injection an iridectomy had been done.

The second case was of glaucoma in a man, 32 years old, whose eye had been struck by a rivet, causing vitreous hemorrhage. Tension gradually rose in three or four days to 96 (Schiotz) in spite of miotics. One retrobulbar injection relieved the pain entirely. The tension slowly returned to normal and the vision improved.

The third case was of glaucoma following thrombosis of the central retinal vein. Here, one injection stopped the pain and reduced the tension but, of course, did not restore the vision.

The author feels that the injection described is a safe therapeutic procedure with a definite field of usefulness

in certain types of acute glaucoma. In some cases it may even be curative and in other cases, tho not curative, may be valuable in reducing tension and relieving pain where miotics have failed.

C. L.

**Ellis, A. W. M. and Manach, J. R.** Renal Function with Retinitis and High Blood Pressure. *Lancet*, 1923, I. p. 891-893.

In the London hospital, the authors studied nineteen cases of retinitis in cardiovascular-renal disease. They found that, from the clinical standpoint, there could be distinguished two definite groups, chronic nephritis and hyperpiesis. There were nine patients with chronic nephritis. These were relatively young individuals, the average age being thirty-three years. All had high blood pressures, averaging 220 mm. Hg. systolic, and gross loss of kidney function, the blood urea being elevated in all, phenolsulphonephthalein excretion being below 25 per cent in all, and the specific gravity of the urine being fixed in 85 per cent. All of these patients died within four months of admission, seven in uremia, one from cardiac failure, and one from bronchopneumonia. There were ten patients with hyperpiesis. Their ages averaged forty-nine years. Tho their blood pressures were higher, the average systolic being 245 mm. Hg., their kidney function was less disturbed, blood urea being elevated in only 20 per cent, phenolsulphonephthalein excretion being less than 25 per cent in only 30 per cent, and there being in no case fixation of the specific gravity of the urine. Five of the ten patients died within six months of admission, three from cerebral hemorrhage and two from cardiac failure.

From this study, Ellis and Manach conclude that retinitis may occur either in primary renal disease with secondary high blood pressure, or in high blood pressure with secondary renal damage, so-called hyperpiesis. The primary renal disease is characterized by rather sudden onset, rapid impairment of kidney function, and early death, usually in uremia. Hyperpiesis is of

relatively gradual onset, is associated with relatively little disturbance of renal function, runs a longer course than nephritis, and ultimately causes death usually thru cerebral hemorrhage or cardiac failure. In three autopsies, the kidney change seemed grossly to be inflammatory in nephritis and ischemic in hyperpiesis, but this distinction was not confirmed by histologic examination.

H. P. W.

**Gonzales, J. de J., Ectasic Marginal Dystrophy of Cornea, VII National Medical Congress, Saltillo, Mexico, 1922.**

The condition was first noted in this patient, a boy, of 16. He remained under observation between the ages of 22 and 32, during which period the indolently progressive evolution of the dystrophy, its stretching, thinning and later ectasia, were noted.

The characteristic gutter like depression occurred only in the right cornea, where a transparent, depressed arc, 2 mm. wide at its widest point, paralleled the limbus of the upper nasal quadrant. A delicate gray, sinuous groove limited the altered cornea on its pupillary side but no precise demarcation existed on the scleral side. The surface was brilliant thruout, altho slightly irregular. Sensation was notably diminished over the lesion but was normal elsewhere. Vision was 6/20, and with  $-3.00$  cyl. ax.  $60^\circ = 6/6$ . There was no arcus senilis and the affected cornea was perfectly transparent. There was neither inflammation nor subjective disturbance.

Three years after the first examination, the width of the involved area had increased and a slight central ectasia had appeared but without any lessening of the transparency of the cornea or of its superficial brilliancy. The astigmatism had increased to  $-5.00$  and had risen in another three years to  $-7.00$  D. At this time increased width and ectasia were noted, but without loss of transparency or brilliancy. The final measurement of the altered area was 5 mm. in maximum width, with a more obvious

ectasia and an astigmatism of  $-9.00$  D. The unusual features of the case are that it was first noted during adolescence; that there was no arcus senilis; that it was unilateral, (tho this is not unique), and that the cornea retained its transparency thruout the evolution of the ectasia.

With regard to the association of this condition with arcus senilis and its classification as a "senile dystrophy," it should be noted that in 7 of the 13 cases reported in the available literature, the condition occurred before 46, and that in 4 of these it was found at the ages of 10, 16, 17 and 18. In several of the cases no gerontoxon existed, but as arcus senilis is of such frequent occurrence, it is by no means surprising that another and unrelated form of corneal degeneration should appear in eyes thus affected. L. M.

**Smith, Priestley. The Blood Pressure in Eye and Its Relation to Chamber Pressure. Brit. J. Ophth., v. VII, No. 10, 1923, p. 449.**

The author discusses the use of certain terms. "Chamber-pressure" stands for "intraocular pressure." Distinction should be made between "pressure" which implies push, and "tension" which implies pull. Pressure of the fluid in the chamber keeps the cornea and sclera in a state of tension.

Central artery pressure has been measured by raising the chamber-pressure and noting its height. The compression of the vessel is watched with the ophthalmoscope. The chamber-pressure must be measured before and after applying pressure. This can be done in the laboratory but is inapplicable in the clinic. Clinically, "chamber-pressure" may be raised by pressing the eye externally. This, however, only measures the increment of pressure induced but not the resulting total.

The investigator performed certain experiments applying the pressure with a disc and knob, recording the results in mm. Hg. The results of these experiments were summarised as follows: The rise of chamber-pressure under a given weight varies with the



form and extent of the surface bearing on the eye: The smaller the surface, the greater the rise.

A given instrument raises the chamber-pressure less when placed on the eyelid than when placed directly on the eye, and the smaller the terminal the greater the difference.

The rise of chamber-pressure, under a given weight, varies with the size of the eye: the smaller the eye the greater the rise.

The rise of chamber-pressure under a given weight varies with the character of the eye wall: the less extensible the tissue the greater the rise.

Equal increments of weight may induce unequal increments of chamber-pressure in one and the same eye.

Four tables showing the findings with ox, pig and sheep's eyes are presented for comparative study.

While it is admitted that this clinical method cannot be expected to measure the pressure in the central artery with precision, it should not be hastily condemned. Particularly so, in comparison with other instruments. It is, therefore, clear that only a rough estimate of the normal pressure in the central artery can be made. Diastolic pressure 40-50, systolic 70-90 mm. Hg. is probably near to the truth, but should be accepted with reserve.

The venous exit-pressure is nearly in equilibrium. The selfadjusting equilibrium of pressure inside and outside the vein safeguards the retina against edema and detachment. Each pulsatile expansion of the intraocular arteries compresses the vein; the intra-orbital vessels are similarly affected. When it is greater within than without, blood is expelled from the eye, suddenly the vein collapses on the papilla-venous pulse. External pressure by finger or dynamometer raises both chamber-pressure and venous exit pressure. This altered relation causing venous pulse to appear and disappear does not abolish their approximate equilibrium, except when pressure is suddenly withdrawn.

Five illustrations and four tables of comparison accompany the contribution.

D. F. H.

**Sgrosso. Immunologic Reaction in Trachoma.** Arch. di Ott., 1923, v. 30, p. 326.

The author examined the serum of trachomatous and other patients by the complement fixation reaction to determine whether or not antibodies are formed in trachoma, and the relation of the immune reactions to those found in other diseases. As antigens were employed, first, material from conjunctival scrapings from trachomatous patients and, second, ground-up lymphatic glands from patients showing the lymphatic constitution. Of fifty cases of trachoma whose sera were tested, forty-one gave positive reactions with the trachomatous antigen, the reactions being more marked in severe cases, especially those with corneal complications. In a second series of eighteen cases all the sera were positive against both trachomatous and lymphoid antigens. The sera of four cases of vernal catarrh and of four cases showing ocular lesions not affecting the conjunctiva were negative. The sera of scrofulous patients (that is, patients with the lymphatic constitution) were positive. This seems to afford evidence disapproving the supposed relation of vernal catarrh to the lymphatic constitution at least as far as the immune reactions of the two diseases are concerned.

S. R. G.

**Kraupa, E. Ring Shaped Detachment of the Vitreous.** Klin. M. f. Augenh., 1923, v. 70, p. 716.

A student, aged 22, who had tubercular optic neuritis of both eyes two years previous, exhibited on the nasal side of the left optic disc an atrophic chorioretinitic patch of two disc diameters. About 4 D. in front of it a fluctuating grayish white arc was seen which disappeared on changing the direction of illumination. Then a double contoured transparent fold of thickened tissue of vitreous appeared, extending to both sides and encircling above and below the focus in a large arc. With the intense arc lamp, the ring could be seen as a fine shot silk membrane attached below to the retina and pre-

senting several round perforations.  $V=1$ .

Kraupa explains the process thus: An inflammatory process of the optic nerve and retina with swelling and transient prominence into the vitreous heals. The swelled tissue returns to normal or becomes cicatrized and shrinks, causing an applanation of the previously curved fundus. The vitreous, which has no intimate attachment to the fundus is, during the subsidence of the swelling, by its own tissue traction drawn from the original place of contact and a ring shaped detachment ensues.

The author emphasizes the importance of such detachments of the

vitreous, which may occur not only at the optic nerve but also at the periphery. Considering a more intimate connection between the vitreous and retina than so far supposed, at a very small place of detachment a traction on the retina may be exerted, so that the retina is torn around a small choroiditic area. This may exist for a long time until the traction of the detaching vitreous may allow subretinal fluid to enter and produce a total detachment of the retina, without the existence of strands in the vitreous. The author also calls attention to the value of intense sources of light, especially the arc lamp in ophthalmoscopy in such cases. C. Z.

## NEWS ITEMS

Personals and items of interest should be sent to Dr. Melville Black, 424 Metropolitan Building, Denver, Colorado. They should be sent in by the 25th of the month. The following gentlemen have consented to supply news from their respective sections: Dr. Edmond E. Blaauw, Buffalo; Dr. H. Alexander Brown, San Francisco; Dr. V. A. Chapman, Milwaukee; Dr. Robert Fagin, Memphis; Dr. M. Feingold, New Orleans; Dr. Wm. F. Hardy, St. Louis; Dr. Geo. F. Keiper, LaFayette, Indiana; Dr. George H. Kress, Los Angeles; Dr. W. H. Lowell, Boston; Dr. Pacheco Luna, Guatemala City, Central America; Dr. Wm. R. Murray, Minneapolis; Dr. G. Oram Ring, Philadelphia; Dr. Chas. P. Small, Chicago; Dr. John E. Virden, New York City; Dr. John O. McReynolds, Dallas, Texas; Dr. Edward F. Parker, Charleston, S. C.; Dr. Joseph L. McCool, Portland, Oregon; Dr. Richard C. Smith, Superior, Wis.; Dr. J. W. Kimberlin, Kansas City, Mo.; Dr. G. McD. Van Poole, Honolulu; Dr. E. B. Cayce, Nashville, Tenn.; Dr. Gaylord C. Hall, Louisville, Ky.; Dr. Edward D. LeCompte, Salt Lake City.

### DEATHS.

Mr. Thomas Prigdin Teale, of Leeds, England, died recently.

Dr. Stephen Wythe, Oakland, California, aged forty-nine, died December 25, 1923.

George Thomas Brooksbank James, of London, England, died November 15, at the age of 56.

Mrs. Henry D. Noyes, of New Rochelle, aged seventy-six, widow of the late Dr. Henry D. Noyes of New York City, died recently.

Dr. Daniel Grant Sanor, Columbus, Ohio, aged fifty-six, died in December following a long illness.

Sir John Tweedy, Emeritus Professor of Ophthalmology, University College, London, and former President of the R.C.S., and of the Ophthalmological Society of the United Kingdom, died suddenly, January 4th, aged seventy-five.

### PERSONALS.

Dr. W. W. Goldnamer of Chicago has located in Oakland, California.

Dr. and Mrs. Casey A. Wood are now in Berkeley, California, for the winter.

Dr. Edwin L. Russell of Kansas City will spend the spring and summer in London and Vienna doing postgraduate work.

Dr. Willis O. Nance of Chicago, who has been confined to his home for several weeks with typhoid fever, is convalescing and able to partially resume his work.

Dr. William A. Hoffman, Chicago, has recently been elected secretary of the Chicago Eye, Ear, Nose and Throat College, to succeed the late Dr. John Raymond Hoffman.

At the last Civil Service Examination for positions on the staff of the Illinois Charitable Eye and Ear Infirmary, Dr. Herbert Walker was elected eye surgeon. His new duties begin January 5th.

Dr. and Mrs. E. K. Findlay of Chicago expect to leave in February on a Mediterranean trip. They will go to Egypt and from there to various European countries, returning home about June.

Dr. W. L. Curtis, formerly of Lincoln, Nebraska, has moved to Long Beach, California, and succeeds to the practice of Dr. J. H. McKellar. Dr. McKellar has reopened offices in Pasadena.

Dr. E. Terry Smith of Hartford, Connecticut, announces that he is discontinuing his ear, nose and throat work, and will devote himself exclusively to diseases of the eye. Dr. Alexander L. Prince, who has been assisting him for some time, will be associated

with him. Their offices will occupy rooms 635-639 Connecticut Mutual Building.

## SOCIETIES.

The Indiana Academy of Ophthalmology and Oto-Laryngology held its seventh annual meeting in Indianapolis on January 16 and 17, 1924. The new officers elected at that time were: President, Dr. B. J. Larkin; first vice-president, Dr. F. McK. Ruby; second vice-president, Dr. D. J. Adams; secretary-treasurer, Dr. E. M. Shanklin.

The annual meeting of the National Committee for the Prevention of Blindness was held in the Russell Sage Foundation Building, New York, November 15th, under the presidency of the Hon. William F. Morgan. The following directors were elected for the ensuing year: Drs. Geo. S. Derby, James Clifton Edgar, Edward F. Glaser, Hiram Woods, Mrs. Seth Low, W. O. Hart, Preston S. Miller, H. F. J. Porter and J. A. Showan.

The Ophthalmological Society of Egypt elected the following officers for 1923-24: President, Dr. Mahmud Zaky; vice-president, Dr. Zaki Seddik; honorable secretary, Dr. Hassan Barrada; assistant honorable secretary, Dr. Galal Abul Seound; honorable treasurer and archivist, Dr. A. F. MacCallan. The annual meeting of the Ophthalmological Society of Egypt will take place at the School of Medicine Examination Room, Student's Club, Cairo, on March 7, 1924.

At the meeting of the Section on Ophthalmology of the New York Academy of Medicine, January 21, 1924, the following cases were reported: "Unilateral Choked Disc, Relieved by Radical Sinus Operation," by Dr. L. W. Crigler; "Recovery of Double Choked Disc Following Trauma," Dr. R. C. Dodd; "Unusual Neuroretinitis," Dr. J. W. Smith; "Angioma of the Orbit," Dr. C. E. McDannald. The paper of the evening was read by Dr. Morris H. Kahn on "Ophthalmoscopy of Postmortem Vascular Changes."

The California Society for the Blind was organized November 8, 1923, with Dr. Edward F. Glaser as president. The society will organize a campaign for the prevention of blindness; the establishment of a nursery and kindergarten for blind children of preschool age; the securing of more adequate provision for the education of intelligent blind children, and for the proper care of the feeble-minded blind; more adequate provision for the in-

dependent and helpless blind; the establishment of special wards for eye cases in the larger hospitals; definite assurance of the continuation of home teaching for the adult blind; the development of vocational training and education of the blind, and the establishment of a placement agency for blind persons who are endeavoring to be self supporting.

## MISCELLANEOUS.

The Abner Wellborn Calhoun Medical Library, dedicated as a memorial to the late Dr. Calhoun of Atlanta, has been opened at Wesley Memorial Hospital. The library contains 5,000 volumes and was presented to the board of directors by his son, Dr. Ferdinand P. Calhoun.

Six teachers, working under auspices of the Pennsylvania Home Teaching Society and Free Circulating Library for the Blind, paid 7,423 visits to sightless persons in ten counties last year, it was reported at the annual business meeting of the society in the Witherpoon Building yesterday. Nearly 2,000 lessons were given in finger reading, knitting, crocheting, sewing and other activities to 576 blind pupils.

Dr. L. Webster Fox was reelected president of the society. Other officers reelected were: Ellis A. Gimbel and the Rev. Llewellyn N. Caley, vice-presidents; Mrs. Isabel W. Kennedy, secretary, and John J. Wilkinson, treasurer.

The report for the year also showed that 31,727 embossed books had been circulated from Philadelphia and 29,099 from Pittsburgh. All were of Moon type, specially designed for finger reading, with every unnecessary line eliminated.

Many children have contracted night blindness since the quake and fire in Tokyo. According to an investigation made by the Tokyo municipality, 27 out of 6,484 pupils of a certain primary school in the city were afflicted with the malady, due to insufficient nutrition.

A commemoration day in appreciation of the work of the late Dr. Charles J. Kipp was held in Newark, N. J., at the Newark Eye and Ear Infirmary, January 13, 1924, the anniversary of his death fourteen years ago. Dr. Kipp was active in the formation, development and management of this institution. Short addresses were made by members of the profession and officers of the board of managers of the infirmary.

## Current Literature

These are the titles of papers bearing on ophthalmology. They are given in English, some modified to indicate more clearly their subjects. They are grouped under appropriate heads, and in each group arranged alphabetically, usually by the author's name in **heavy-faced type**. The abbreviations mean: (Ill.) illustrated; (Pl.) plates; (Col. Pl.) colored plates. Abst. shows it is an abstract of the original article. (Bibl.) means bibliography and (Dis.) discussion published with a paper. Under repeated titles are given additional references to papers already noticed. To secure early mention, copies of papers or reprints should be sent to American Journal of Ophthalmology, 217 Imperial Building, Denver, Colorado.

### BOOKS.

- D'Albe, E. E. F.** Life of Sir William Crookes. London, 1923. T. Fisher Unwin, Ltd. 412 pages. Lancet, 1923, v. 205, p. 1360.
- Jullien, W.** Inégalité pupillaire et tuberculose pulmonaire. Paper, 117 pages, 14 illustrations, Paris, 1923, Amédée Le Grand. J. A. M. A., 1924, v. 82, p. 55.
- L'Hygiene de l'Oeil et le Travail Industriel.** Problems of Industrial Illumination. Geneva, International Labor Office of the League of Nations, 1923, 160 pages. Lancet, 1923, v. 205, p. 1403.
- Ophthalmological Society of Egypt.** Bulletin of 1923. Paper, 170 pages, 14 illustrations, including 9 colored plates, Cairo, 1923. A. J. O., 1924, v. 7, p. 62.
- Sajous, C. E. de M. and L. T. de M.** Sajous' Cyclopedia of Practical Medicine. Supplement. Cloth, 825 pages, illustrated. Index to Seventh Edition and Supplements, cloth, 481 pages, Philadelphia, F. A. Davis Co. A. J. O., 1924, v. 7, p. 63.

### DIAGNOSIS.

- Alabaster, E. B.** Mirror for focal illumination. Trans. Ophth. Soc. United Kingdom, 1923, v. 43, p. 632.
- Alexander, G. F.** Measurement of diameters of cornea and pupil and interpupillary distance. Trans. Ophth. Soc. United Kingdom, 1923, v. 43, p. 354.
- Theorem generalizing optical problems of ophthalmoscopy and skiascopy. Trans. Ophth. Soc. United Kingdom, 1923, v. 43, pp. 355-357.
- Batten, R. D.** Drawing of fundus in clinical ophthalmology and training of ophthalmic draughtsman. Trans. Ophth. Soc. United Kingdom, 1923, v. 43, pp. 562-568.
- Memory drawing in relation to ophthalmic drawing. Trans. Ophth. Soc. United Kingdom, 1923, v. 43, pp. 569-577.
- Fenton, R. A.** Routine scotometry in borderline cases. (dis.) Trans. Pacific Coast Oto-Ophth. Soc., 1923, pp. 26-31.
- Graves, B.** Microscopy of living eye. (17 ills.) Trans. Ophth. Soc. United Kingdom, 1923, v. 43, pp. 386-409.
- Hay, P. J.** Minimum vision for attendance at ordinary school. Trans. Ophth. Soc. United Kingdom, 1923, v. 43, p. 649.
- Jackson, E.** Diagnosis of blindness. A. J. O., 1924, v. 7, p. 58.
- Lang, B.** Unobstructed field in perimetry. (1 field) Trans. Ophth. Soc. United Kingdom, 1923, v. 43, pp. 330-332.
- Paterson, A. T.** Portable lighting apparatus for ophthalmic work. Lancet, 1923, v. 205, p. 1404.

**Trantas.** Total ophthalmoscopy by lighting by contact with pressure on globe. Clin. Ophth., 1923, v. 27, p. 612.

**Traquair, H. M.** Differential characters of scotomata and their interpretation. (1 ill. 35 fields) Trans. Ophth. Soc. United Kingdom, 1923, v. 43, pp. 480-533.

Repeated titles. **Alemán Guillamón.** (A. J. O., 1924, v. 7, p. 72) Intern. Sur. Ophth., 1923, v. 6, p. 273. **Bruns.** (A. J. O., 1923, v. 6, p. 1017) Intern. Sur. Ophth., 1923, v. 6, p. 336. **Lebermann.** A. J. O., 1923, v. 6, p. 1018) Intern. Sur. Ophth., 1923, v. 6, p. 276.

### THERAPEUTICS.

- Barkan, O. and Nelson, R. F.** Milk injections in ocular diseases. (1 chart, bibl. dis.) J. A. M. A., 1924, v. 82, pp. 190-193.
- Key, B. W.** Antidiphtheric serum in ocular infection. (20 ills. bibl.) J. A. M. A., 1924, v. 82, pp. 183-190.
- Lundsgaard, K. K. K.** Light treatment of conjunctival diseases. (dis.) Trans. Ophth. Soc. United Kingdom, 1923, v. 43, pp. 475-480.
- Peterson, R. A.** Ocular therapeutics. China Med. Jour., 1923, v. 37, p. 842.
- Plummer, F. C.** Cocain habit from eye drops. Brit. Med. Jour., 1923, Dec. 15, p. 1180.
- Sanguinetti, C.** Foreign protein therapy in ophthalmology. Gior. di Ocul., 1923, v. 4, p. 183. Abst. Intern. Sur. Ophth., 1923, v. 6, p. 282.
- Vancea, P.** Milk injections in ophthalmology. Clujul Med., 1923, v. 4, p. 278. Abst. Intern. Sur. Ophth., 1923, v. 6, p. 283.
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### OPERATIONS.

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### PHYSIOLOGIC OPTICS.

- Hartline, H. K.** Influence of light of very low intensity on phototropic reactions of animals. Jour. Gen. Physiol., 1923, v. 6, p. 137.
- Mohr, F.** Psychophysical method in ophthalmology. Arch. f. Augenh., 1923, v. 93, p. 83. Abst. Intern. Sur. Ophth., 1923, v. 6, p. 229.



**Story, J. B.** Theory of vision by Schanz. (dis.) Trans. Ophth. Soc. United Kingdom, 1923, v. 43, pp. 693-697.

**Trettenero, A.** Phenomena of diffraction, inclination and polarization of light and their diagnostic value in application to Gullstrand slit lamp. (bibl.) Ann di Ottal. e Clin. Ocul., 1923, v. 51, pp. 835-849.

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**Evans, J.** Staphyloma of posterior pole. Trans. Ophth. Soc. United Kingdom, 1923, v. 43, p. 631.

**Friedenwald, J. S.** Astigmatic chart. (9 ills. bibl.) A. J. O., 1924, v. 7, pp. 8-15.

**Hay, P. J.** Inability of myopic child to maintain working distance. (3 tables, dis.) Trans. Ophth. Soc. United Kingdom, 1923, v. 43, pp. 325-330.

**Lespinasse.** Clinical considerations of corneal astigmatism in medicine. Bordeaux thesis, 1923. Gaz. des Hôp., 1923, v. 96, p. 1626.

**Peter, L. C.** Relation of exophoria in early presbyopia to refractive errors. Brit. Jour. Ophth., 1924, v. 8, pp. 20-24.

**Valentine.** Diving spectacles. Royal Soc. Med. Sec. on Ophth., 1923, Nov. A. J. O., 1924, v. 7, p. 53.

**Ziegler, S. L.** Use of prism scale to neutralize and center spectacle lenses. Trans. Ophth. Soc. United Kingdom, 1923, v. 43, p. 578.

Repeated titles. **Canitano.** (A. J. O., 1924, v. 7, p. 73) Intern. Sur. Ophth., 1923, v. 6, p. 295. **Levinsohn.** (A. J. O., 1923, v. 6, p. 1018) Intern. Sur. Ophth., 1923, v. 6, p. 297. **Müller.** (A. J. O., 1923, v. 6, p. 1018) Intern. Sur. Ophth., 1923, v. 6, p. 295. **Witte.** (A. J. O., 1924, v. 7, p. 73) Intern. Sur. Ophth., 1923, v. 6, p. 296.

#### OCULAR MOVEMENTS.

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**Butler, T. H.** Muscle recession and muscle tucking. (1 ill.) Trans. Ophth. Soc. United Kingdom, 1923, v. 43, pp. 579-586.

**Coulter, R. J.** Diagnosis of coal miners' nystagmus. (dis.) Trans. Ophth. Soc. United Kingdom, 1923, v. 43, pp. 586-611.

**De, J. C.** Ocular paralysis with glycosuria. Indian Med. Gaz., 1923, v. 58, p. 589.

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**Hird, B.** Nystagmus with unusual features. Trans. Ophth. Soc. United Kingdom, 1923, v. 43, p. 628.

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**Bywater, H. H.** Tubercular disease of conjunctiva. Trans. Ophth. Soc. United Kingdom, 1923, v. 43, p. 679.

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**Nicolich, M.** Trachoma in relation to etiology and treatment. Los Progresos de la Clínica, 1923, v. 26, pp. 663-668. and 740-744.

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